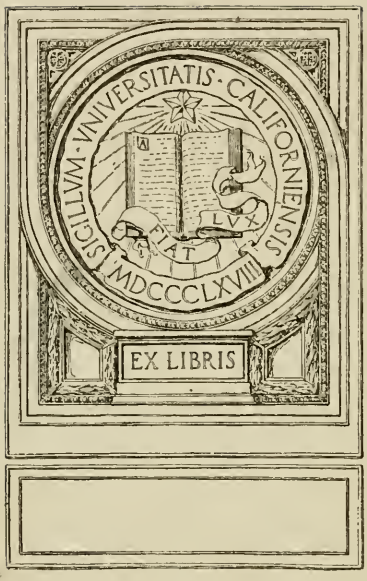
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ERRATA.

Page 201, line 5, after "reach grasp" insert "step."
,, 209, ,, 1, "bones, &c." should be omitted.
,, 262, ,, 18, for 37° read 98·6°.
,, 323, ,, 2 should be omitted.
,, 460, ,, 6 from bottom, for "musculo-spinal" read "musculo-spiral."

THE ELEMENTS OF

KELLGREN'S MANUAL TREATMENT

BY

EDGAR F. CYRIAX

M.D. Edinburgh, 1901; *Gymnastic Director, Stockholm*, 1899

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PREFACE.

This book has been written with the object of providing the medical profession with a scientific exposition of the methods comprised under what is widely known as "Kellgren's Manual Treatment." It is founded upon the thesis which, under the same title, was accepted with commendation by the University of Edinburgh in 1901, and gained for me the degree of M.D.; but the original thesis has undergone considerable expansion. Greater experience, more extended observation and a wider range of reading have led me to add so much to the first part that it has in effect been rewritten; and in the second part I have included the details of many cases treated in the course of my practice after leaving Edinburgh.

Some exceptional difficulties have attended the compilation of this treatise. For the first time has been attempted a systematic, detailed description of Kellgren's Manual Treatment; and the task, onerous in itself, has been complicated by the fact that the physiological groundwork was insufficiently investigated, experimenters having hitherto conducted but few researches into the phenomena resulting from gymnastic exercises. In addition, I have only been able to write during the occasional hours I could spare from my practice, the continuance of which being necessary not only for the double design of accumulating fresh evidence and verifying conclusions already drawn, but also for the purpose of widening as far as possible in every direction the range of that practical work which forms the basis of all sound theory.

The present volume, although dealing with all the chief features of the subject under consideration, makes no pretence to exhaustiveness. I trust it will prove of such interest to the medical profession as to stimulate further enquiry, and I look forward to the time when many of the hitherto unsolved problems connected with the manual treatment will cease to baffle our understanding. Above all, it is my earnest hope that

this treatment will receive the acknowledgment and encouragement it so richly deserves, and that it will speedily be relegated to its proper place in the world of modern theurapeutics.

My very best thanks are due :

To Mr. Henrik Kellgren, under whom I have studied at intervals from 1893 until the time of writing, and to whom I lie under obligations of gratitude which it is impossible to repay.

To Dr. Harry Kellgren, for most useful aid in many directions, including the classification and description of shakings, vibrations, and frictions.

To Professor Starling, for valuable advice on some of the points connected with the physiological effects of the various movements.

To Mr. Allan Broman, for many kind suggestions and for generous assistance in the revision of the whole of my work.

To my wife, Annjuta Cyriax, medical student, my sister, Eva Cyriax, B.Sc., and Mr. Svahnberg, for help in numerous ways which it would take too long to specify minutely.

EDGAR F. CYRIAX.

London, 1903.

PART I.

GYMNASTIC MOVEMENTS.

THE ELEMENTS OF KELLGREN'S MANUAL TREATMENT.

CHAPTER I.

INTRODUCTORY.

Although medical gymnastics and also massage in some form or other have been in use for all time of which there exists any historical record, the first attempt to place a system of such movements on a scientific basis was made by the Swede, Pehr Henrik Ling.

Ling was born in Ljunga, in the south of Sweden, in 1776. He matriculated in 1793, and applied himself to the study of divinity, intending to follow in the footsteps of his father; in 1797 he took his degree. But his restless spirit rebelled against a sedentary life; Ling wished to travel, and accordingly left his native country. First he went to Copenhagen, where he figured in various capacities, amongst others as a teacher of modern languages. Then he left Copenhagen, but of the ensuing few years of his life information is meagre and indefinite. It is certain that he visited Germany and France; and also it is probable that during the course of his wanderings he spent some time in England; but his career cannot be traced again with accuracy until 1804. In that year Ling was back in Sweden, and in the town of Lund was established as an instructor in the arts of fencing and gymnastics. While on the Continent he had been compelled in consequence of pecuniary difficulties to undergo many hardships and privations, resulting in serious damage to his health; at the time already referred to his constitution was much impaired, and he was a constant martyr to rheumatism. Bodily

ailments did not, however, keep him from pursuing an active life, and his reputation as a master of fencing and gymnastics developed into considerable fame.

The movements and exercise necessitated by his daily work soon proved of great benefit to his physical condition, and shortly after his appointment in 1805 as fencing master to the University of Lund, Ling found that his rheumatism had disappeared, and that he had regained his former strength and vigour. These facts turned his thoughts in a new direction. What had been of benefit to himself might also be of benefit to others, and he came to the conclusion that it ought to be possible to devise various movements with different physiological effects for the treatment of various ailments. He likewise argued that a further series of movements could be contrived which would tend not only to keep healthy persons in that condition, but also to strengthen them by developing their bodies equally in all directions.

The question now arose: how could these theories be turned to practical account? Ling saw that it was impossible to work out a rational system of gymnastics without previous knowledge both of the structure of the human organism and of its complex functions; he brought the matter to the notice of the Senatus of the University, and made formal application for permission to study anatomy and physiology. This was readily granted, and in 1806 he began to attend the dissecting-rooms and hear lectures. Not only did he make himself a thorough master of what at that time could be learnt in the departments of medical science above specified, but in the course of years he went through nearly the entire curriculum required of candidates for degrees in medicine and surgery, without, however, actually taking any qualification.

In the light of the extensive knowledge thus obtained, Ling, by adopting, adapting, and modifying some of the movements he had learnt on the Continent, and by devising many other new ones, at last produced a practically new system of gymnastics which is called after him. This system is divided into four branches:—

(1) Pedagogical (educational), in which the individual learns to place his body under his own control.

(2) Medical, in which is learnt the alleviation or cure of diseased conditions.

(3) Military (antagonistics), in which the individual learns to

bring an external object (*e.g.*, a weapon) under his own will and control.

(4) Æsthetic, in which the individual learns by movements (gestures) to express his inner thoughts and feelings.

The system very soon awoke the public interest, and Ling tried to induce the Swedish Government to assist him in founding an institution for the practice, study, and teaching of the new methods. His efforts, for some time in vain, were at length crowned with success, and in 1813 the Royal Gymnastic Central Institute,[1] subsidised by State, was opened in Stockholm, and he was appointed its first Principal.

The medical part of his system did not at first meet with the approval of members of the orthodox medical profession, who, in fact, did all they could to prevent its gaining ground. This is scarcely to be wondered at, as the fundamental principle on which it was founded (*i.e.*, the beneficial effect of movement) was directly opposed to the doctrines which had ruled for so many years. Ling and his pupils, however, in the face of great discouragements, persisted in their efforts to get the value of their methods recognised; they kept on demonstrating practically the results which could be obtained thereby, and at length, after many weary years of work and waiting, they achieved their purpose, as is evident from the fact that in 1831 Ling was elected by the Swedish General Medical Association to be a member of their body.

Ling died in 1839, and according to his own words, uttered shortly before his death, left behind him only two men who really understood his system and were capable of furthering its progress.[2] These were Lars Gabriel Branting, the greatest of all his pupils, and Karl Augustus Georgii. The former already installed at

[1] I shall in the ensuing pages use the abbreviation G.C.I. to denote this Institute.

[2] The following is a list of the chief biographical papers on Ling:—Frost, "Minnesord öfver . . . P. Henrik Ling," &c., May 9, 1839, translated into German in 1861 by Rothstein, under the title of "Gedenkrede auf Pehr Henrik Ling." Atterbom, "Inträdestal i Svenska Akademien," 1840. Werlauff, "Bidrag till P. H. Ling's Biografi," in *Frey*, 1848, pages 92-105. Nyblæus, "Ling och Gymnastiken," 1853. Georgii, "A Biographical Sketch of the Swedish Poet and Gymnasiarch, Pehr Henrik Ling," 1854. Beskow, "Minnesteckning P. H. Ling," 1866. Nyhlæus, "Minnestal öfver Pehr Henrik Ling," 1876. J. L. (Jetta Liedbeck), "Pehr Henrik Ling," in *Tidskrift i Gymnastik* (the biannual journal of the G.C.I.), vol. iii., part 10, 1893, pages 870-891. Törngren, "Minnestal öfver Pehr Henrik Ling den 15 Nov., 1896," in *Tidskrift i Gymnastik*, vol. iv., part 7, 1896, pages 413-432.

the G.C.I. as one of the head instructors, stepped into the chair rendered vacant by Ling's death; Georgii became sub-director, which post he held until 1849.[1]

About this time two new men came into prominence, Major Rothstein and Dr. Neumann, both Germans, who went to Stockholm in order to study Ling's system. Later on Rothstein published the only systematic comprehensive work on Ling's system that exists (although the section on medical gymnastics is incomplete, and the one to which least space is devoted). It is entitled "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen P. H. Ling." Neumann, a most careful observer, published various treatises—"Die Heilgymnastik," "Lehrbuch der Leibesübungen," &c., which, although excellent in many parts, are characterised by a decided tendency to exaggeration and hyperoptimistic views. To Rothstein and Neumann belongs the credit of having introduced Ling's system into Germany.

When Branting resigned in 1862, Georgii was invited to succeed him, but declined, chiefly because he was attempting to introduce Ling's system into England, and did not wish to leave the field of his labours.

Both Branting and Georgii were assisted in their work by Hjalmar Ling[2] (son of P. H. Ling), who was as energetic as either of the others in developing his father's system. He was professor of anatomy at the G.C.I., from 1851-1864, when he was appointed professor of pedagogical gymnastics, a position which he retained until 1882. Together with Thure Brandt,[3] who specialised in the gymnastic treatment of female diseases, the afore-mentioned Swedes must be regarded as the pioneers of the system, and as those who did most for it. No one of them possessed the orthodox medical qualification; but each had minutely studied anatomy, physiology, pathology and the necessary branches of science without knowledge of which they would, of course, have been helpless and unable to make any progress.

[1] Short biographical sketches of Branting and Georgii have been published by Hartelius in *Tidskrift i Gymnastik*, *i.e.*, Hartelius's "Lefnadsteckning öfver L. G. Branting," part 15, 1881, page 931, &c., and "Lefnadsteckning öfver Carl August Georgii," part 16, 1881, page 989.

[2] No biographical sketch of Hjalmar Ling has been published in *Tidskrift i Gymnastik*.

[3] A biographical sketch of Thure Brandt has been published by Wide in *Tidskrift i Gymnastik* for 1895, part ii., p. 247.

Although the results had been recognised by the members of the medical profession in Sweden, but few of the latter studied the system at all carefully or with a view to actually practising it. One of those who did so was T. J. Hartelius, M.D.,[1] who was appointed professor of the medical department of the G.C.I. in 1864. He retained his post there until 1887, when he was succeeded by Robert Murray, M.D., who holds it to the present day.

In order for a non-medically qualified man to graduate as a practitioner of Ling's medical gymnastics, the complete course at the G.C.I. must be taken; this lasts three years. Candidates have to acquire a theoretical and practical knowledge of pedagogical, military and medical gymnastics, together with anatomy, physiology, pathology and symptomatology. In the case of qualified medical men a course of one year (such as I attended 1898-1899) is deemed sufficient. It consists of practical and theoretical instruction in pedagogical and medical gymnastics, the military portion not being considered essential. A knowledge of the pedagogical portion is regarded as of the greatest importance, as from it the medical branch is and has been to a great extent evolved; some of the exercises are common to both, and there is no sharp line of demarcation between the two. Also pedagogical gymnastics are to be regarded as forming a hygienic and a prophylactic system; by developing the entire body they promote health and strength, and thus tend to ward off disease; or if the latter has set in they enable the body to recover from disease more quickly and thoroughly than could otherwise have been the case.

At the end of the curriculum, after duly passing all examinations (which are conducted only in the Swedish language), the candidate receives the title of Gymnastic Director, which legally entitles him to practice as a medical gymnast, and places him under the jurisdiction of the General Medical Council.

In spite of the fact that there is such a special course of short duration for medical men, very few avail themselves of it, and continual complaints have been raised that doctors and others coming from various parts of the world to Stockholm pay casual visits to the Institute, varying from a few minutes to a few weeks, and then return home posing as authorities on Ling's medical

[1] A biographical sketch of Hartelius has been published by Levin in *Tidskrift Gymnastik*, 1896, part ii. p. 449.

gymnastics. Hjalmar Ling, in his preface to Branting's posthumous works, issued under the title of "Efterlemnade Skrifter" in 1882, says (pp. xlvi. and xlvii., translated), "Frenchmen, Belgians, Englishmen, Italians and Russians, have in the course of years now and then sent here so-called authorities, who have stayed in Stockholm a few days, partaken of ceremonial dinners, looked on at the gymnastics without taking any practical part in them, and who understood nothing, neither the language nor the subject." Such complaints are still rife and Professor Törngren (now head of the Institute) and Professor Murray have frequently been heard to deplore the fact that such flying visits are the rule and not the exception.

It is a matter of great regret that neither P. H. Ling, Branting, Georgii, nor Hj. Ling ever issued a comprehensive work on the subject of Ling's *medical* gymnastics.[1] Being absorbed in obtaining practical results they had but little time to devote to writing, which they left to others. P. H. Ling[2] says: "I have gone my own way and have not written," a statement which as far as medical gymnastics are concerned might with equal truth have come from his pupils mentioned above.

In consequence, any one who wishes to enrich the literature of the subject is hampered at the outset by the absence of any standard comprehensive work by a real authority. And as a result of the casual hurried visits mentioned above, the vast majority of books and articles written on the subject by so-called "authorities" show a deplorable ignorance of even the very elements of Ling's system. And in the course of time new authors, unable to carry out researches on their own account, have been compelled to fall back upon the productions of persons no better informed than themselves. In this way there has accumulated an extensive literature about Ling's system, but

[1] The following is a list of their works on medical gymnastics:—P. H. Ling, "Gymnastikens Allmänna Grunder," 1834 (1840), reprinted with additions in 1866 (a small portion only). This work was translated by Massmann and issued under the title of "P. H. Ling's Schriften über Leibesübungen," in 1847. Branting, "Efterlemnade Skrifter," 1882 (a portion only). Georgii, "Kinésithérapie ou Traitement des Maladies par le Mouvement," 1847; "A few words on Kinesipathy, or Swedish Medical Gymnastics," 1850; "The Movement Cure," 1853. Hj. Ling, "De Första Begreppen af Rörelseläran," 1866 (portion only); "Förkortad Öfversigt af Allmän Rörelselära," 1880 (portion only); preface to Branting's "Efterlemnade Skrifter," 1882 (portion only).

[2] "Gymnastikens Allmänna Grunder," 1834 (1840), p. 1.

only very few works can be selected from it that have real value. It would appear that nowadays the mere production of a book labelled "Die Schwedische Heilgymnastik," or bearing some similar title, is regarded as proof positive of the author's practical and theoretical ability.

Of late years much has been done to degrade the profession of medical gymnast, and the system has suffered in consequence. Nowadays all gymnasts in Sweden have to act under the supervision of a medical man, which would certainly be an advantage for the former were his method of treatment understood by the latter. Unfortunately, however, the majority of medical men know next to nothing about it. Instances continually recur of patients who, while undergoing a gymnastic cure, are ordered to stop it every now and then because they complain of not feeling quite as well as they might be; often their medical man orders them rest in bed and some medicinal remedy until they feel better.[1] This certainly implies that the members of the medical profession in Sweden regard gymnastics as a somewhat dangerous method of cure. At any rate they nowadays trust only the simplest cases to the gymnast, and they are more and more disposed to limit the field of diseases in which gymnastic treatment might be used with benefit. All this has resulted in what may be described as "oppression of the gymnastic profession."

Ling's system has during the last few years undergone considerable modification; this is mainly due to the efforts of Anders Wide, M.D., of Stockholm. The latter has embodied his ideas in a book entitled "Handbok i Medicinsk Gymnastik," published in 1895-1896, translated into German in 1897, into French in 1898, and into English, under the name of "Handbook of Medical Gymnastics," in 1899; the Swedish edition was re-issued in 1902 as "Handbok i Medicinsk och Ortopedisk Gymnastik," and translated in the next year into English as "Handbook of Medical and Orthopædic Gymnastics." Until the publication of his works the only systematic treatise that had been issued in Swedish was Hartelius' "Lärobok i Sjukgymnastik," 1870, reprinted 1883 and 1892. In consequence, Wide's publications have been accepted as standard works, especially by Swedish

[1] This, as can readily be understood, is a great grievance for the gymnast. *Cf.* Hartelius, "Den Pedagogiska och Medicinska Gymnastiken," in *Tidskrift i Gymnastik*, vol. i., part 7, 1887, p. 313, &c.

medical men, who, as I have said before, in the main know hardly anything about this branch of therapeutics; they have also been thus accepted by many medical men on the Continent[1] who have taken up massage and gymnastics as a speciality. It shows, however, how little his supporters know about Ling's gymnastics when I assert as beyond doubt that the first part of his handbook (consisting of about 150 pages), containing the descriptions of the various movements, teems with misstatements and technical errors. Besides this it is obvious to a careful student that the *modus operandi* of many of the exercises is described so faultily that it is impossible to gather the precise mode of execution, and the effects that these exercises are meant to produce, both from a physiological and anatomical point of view, are in the majority of cases entirely omitted. Most emphatically a handbook based on such a lack of sound fundamental principles should never have been written. The results of the cases treated by Wide are seldom in any way remarkable, and in some cases they show a distinct retrogression compared with the results obtained from Ling's system in past years. In fact, gymnastics given formerly according to the latter's methods are becoming modified to suit those of Wide, and this is a change for the worse, one which I sincerely hope may soon be effectively checked.

Henrik Kellgren, born in 1837, entered the G.C.I. in 1863, and worked there under Hartelius and Hj. Ling until 1865, when he graduated as gymnastic director. Soon after he had begun to practice as medical gymnast he improved many of the manipulations already existing in Ling's system, and added some that were new (without, however, attempting to publish anything concerning the same). As an example of the new manipulations may be quoted nerve frictions and vibrations, by means of which he was able to treat with remarkable success diseases of the central nervous system, &c., and which, in his hands, formed a powerful weapon to combat acute specific infectious diseases.

It would appear, therefore, that at the present time there are two distinct branches of Ling's system. The one, as expounded

[1] Many criticisms on Wide's German translation have been reprinted, under the title of "Referate über Handbuch der Medicinischen Gymnastik von Dr. Med. A. Wide," by O. Wide, in *Tidskrift i Gymnastik*, 1898, part 2, pp. 712-734.

in Wide's handbook, is a distinct retrogression and does not compare favourably, either in method or results, with Ling's system as practised by Branting, Georgii and Hartelius. The other, as practised by Henrik Kellgren, marks an equally distinct progress, both in the variety and the technique of execution of the movements, and also in the application of the treatment to many fresh cases, hitherto untouched by the hand of the gymnast. It is the latter branch, to which the name of Kellgren's Manual Treatment has been given, that I intend to interpret in this work.

Some of the changes made by Kellgren are often apparently slight, and an inexperienced person might either fail to detect them, or consider them too trivial to be worth regarding. With respect to this treatment, however, more so than in the case of any other, such apparently slight improvements often make a very great difference in actual practice, and heighten enormously the beneficial effect aimed at.

The medical profession all over the world has until now almost completely ignored Kellgren's treatment, and thus there are hardly any essays from medical men on the subject. The only attempt to describe any of Henrik Kellgren's exercises and manipulations are to be found in the writings of his brother, Arvid Kellgren,[1] for many years a pupil under him, a graduate of the G.C.I. and M.D. of Edinburgh. Apart from these a few casual notes by other authors have appeared from time to time in stray medical periodicals, but that is all; in short, the literature on Kellgren's treatment is practically *nil*.

[1] These are "Vorträge über Massage," consisting of a course of sixteen demonstrations given at Pola at the request of the surgeons of the Imperial and Royal Hungarian Navy in 1888-1889, reproduced in "Statischer Sanitätsbericht über die Kaiserliche und Königliche Kriegsmarine für das Jahr 1888," and "Technic of Ling's System of Manual Treatment," the first half of which is practically the same as the foregoing, which was accepted as the author's thesis for the degree of M.D. at Edinburgh in 1890. His latter work has been translated into French, Italian, and with some few alterations and additions, into German.

CHAPTER II.

GENERAL CLASSIFICATION AND DEFINITIONS.

As Kellgren's methods are based upon Ling's, I shall, whenever possible, follow the example of the best textbooks[1] on Ling's system regarding classification, arrangement, &c., of the various positions, exercises and manipulations.

The Swedish term "Sjukgymnastik," which may be translated as "medical gymnastics," has at various times been replaced by synonyms, such as "Rörelsekuren" (*i.e.*, movement cure), Heilorganik (Neumann[2]) "Kinésithérapie," "Kinesipathy" (Georgii[3]) and others too numerous to mention.

By a gymnastic position is meant the posture which must be correctly assumed before a gymnastic movement either of the active or passive kind can be executed, and which must be strictly maintained throughout the performance of such movement (with the exception, of course, of that part of the body which is actively brought into play thereby). This rule is only relaxed in certain cases of passive movements (see Chapter VI.).

To define a "gymnastic movement" is not easy, because the term is applied to everything from the most powerful active exercise to the most gently and lightly-applied passive manipulations. Its various significations will best be gathered from the following classification and descriptions.

Gymnastic movements are divided into:—

I.—Active.
II.—Passive.

I.—Active Movements are such as are performed by an

[1] The only two textbooks of any real value are as follows: Neumann, "Die Heilgymnastik," 1852; Hartelius, "Lärobok i Sjukgymnastik," first edition 1870, second edition 1883, third edition 1892.

[2] "Das Muskelleben des Menschen in Beziehung auf Heilgymnastik und Turnen," 1855, p. iii.

[3] "Kinésithérapie ou Traitement des Maladies par le Mouvement," 1847. "A Few Words on Kinesipathy, or Swedish Medical Gymnastics," 1850.

individual through his own volition, and by means of his own effort.

In order to accomplish any active movement definitely and exactly it is necessary to determine clearly the following conditions: (1) a point of departure, *i.e.*, a commencing position; (2) a certain number of intermediate positions, which could theoretically be extended to infinity; (3) a point of termination, *i.e.*, a final position; (4) the velocity and rhythm of the movement.

Active movements are of two kinds:—

(1) Without resistance, called purely active or unduplicated. These are further divided into (*a*) free; (*b*) bound.

(2) With resistance, called duplicate. These are further divided into (*a*) concentric; (*b*) excentric.

Purely active movements are those in the course of which no external resistance is offered to the patient's efforts. With the "bound" variety, steadiness and isolation are secured by means of fixation or support either from apparatus or from external assistance applied by another person; with the "free" variety no such means are employed.

Duplicate movements are those in the course of which another individual, henceforth to be called the assistant, resists the efforts of the patient, or *vice versâ*. The resistance or force used by the assistant is modified according to each patient, his daily variation, and the nature of the malady under treatment, so that the maximum effect desirable be obtained.

In a duplicate concentric movement the assistant resists while the patient causes his own contracting muscles to shorten.

In a duplicate excentric movement the patient resists, while the assistant causes the former's "contracting"[1] muscles to become longer.

The terms "duplicate concentric" and "duplicate excentric" were first introduced into German by Neumann,[2] and have since been adopted by the Ling school, who speak of either "duplicerade" or "dubbel" exercises. The older terms were "half-

[1] It seems a contradiction to speak about contracting muscles becoming longer, but the terms are those used in physiology.

[2] *See* "Zur (Schwedischen) Heilgymnastik" in Casper's *Wochenschrift*, 1849; "Heilgymnastische Fragmente," *ibid.*, 1850; "Die Heilgymnastik," 1852, pp. 15, &c.

aktiv" and "half-passiv" (*cf.* Rothstein,[1] Eulenburg,[2] &c.), and were distinctly misleading, as they gave the impression that the exercises so named involved less expenditure of energy than purely active ones. Georgii[3] used the expression "specific active," Branting[4] used the adjectives "tilltagande" and "aftagande," words which, literally translated, mean increasing and decreasing. Another term used by the Ling school is "Motståndsrörelser," *i.e.*, resistance (also called resisted) exercises (German "Widerstandsübungen").

In rare cases duplicate movements are given so that the assistant offers just so much resistance as the patient is unable to overcome, but not so much as to overpower the patient's efforts; *i.e.*, there is equilibrium of the opposing forces, and no movement at any joint actually takes place, although the muscles called into action may exert considerable strength.

During the performance of a duplicate movement according to Kellgren's method, an additional stimulatory effect is obtained by means of the so-called "traction," as follows: the assistant, when possible, always elongates the part he desires to affect by stretching its distal free end away from its proximal fixed one, maintaining this condition throughout the movement.

It has been stated that both Branting and Hj. Ling used this traction when giving resisted exercises. The obvious rejoinder is that none of their writings even so much as mention it; nor is it even referred to in the works of Neumann, Eulenburg, Georgii, Roth, Rothstein, or Hartelius. Most certainly it was not in use and not advocated at the G.C.I. when I was a student there in 1898-1899.

Henrik Kellgren considers that the application of traction is a very important factor, a point which can easily be verified by executing the same exercise both with and without it. The difference will in most cases manifest itself in a very striking manner.

[1] "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen, P. H. Ling," 1847, vol. i., pp. 14, &c.

[2] Eulenburg discusses the question as to choice of terms in "Die Lingsche oder Schwedische Heilgymnastik in Ihrem Werthe von Rationell-medicinischen Standpunkte," in *Göschen's Deutsche Klinik*, 1852, p. 338; and in "Über Wesen und Ziel der Pädagogischen Gymnastik und über deren Verhältniss zur Schwedischen Heilgymnastik," &c., *ibid.*, 1857, p. 271.

[3] "Kinésithérapie," 1847, p. 31; "The Movement Cure," 1853, p. 8.

[4] Branting's "Efterlemnade Skrifter," 1882, p. 8.

As an extra group may be specified active movements with assistance. To this variety belong such cases as those in which a patient is unable to achieve a movement unaided (in consequence of muscular contracture, partial paralysis, adhesions, &c.), but may yet be enabled to perform it by means of a certain amount of help (reduced to the minimum).

II.—Passive Movements are such as are applied by the assistant to the patient without the latter offering any resistance or assistance.[1] There are two main classes :—

(1) A joint or joints are moved, *i.e.*, the corresponding active movements are imitated.

(2) No joint is moved. This class comprises such manipulations as "hacking" and "vibration."

[1] Some Continental authors, after first giving some such definition as the above, go on to describe passive concentric movements, during which the assistant resists, and passive excentric ones, during which the patient resists!

CHAPTER III.

GYMNASTIC POSITIONS.

I SHALL now proceed to a brief description of the more important gymnastic positions as utilised by Henrik Kellgren although they are in most cases practically identical with the corresponding ones in Ling's system.

It has previously been explained what is meant by a gymnastic position, and it must be emphatically insisted upon that the accuracy of any such position is absolutely essential to the proper performance of the movement or movements to follow.

Gymnastic positions are divided into .—

I.—FUNDAMENTAL.
II.—SECONDARY OR DERIVED.

I.—FUNDAMENTAL POSITIONS.—These are five in number:—(1) Standing, (2) sitting, (3) lying, (4) kneeling, (5) hanging.

(1) *Standing position.*[1]—The patient stands so that the heels are together, the feet at right angles, the knees straight, the trunk erect and stretched, the abdomen drawn somewhat in, the chest well forward, the shoulders drawn down and back, the head erect with the chin drawn in. The arms hang by their own weight, the palms resting against the thighs (fig. 1).

(2) *Sitting position.*—The patient sits so that the arms, trunk and head are placed as in the previous position, while the knees and thighs are flexed to a right angle and the feet in their entire length rest on the ground (fig. 2).

(3) *Lying position.*—The patient rests from head to heels on a horizontal couch, the arms lying along the sides (fig. 3). In pedagogical gymnastics, where the subject has to stretch the

[1] In Branting's "Efterlemnade Skrifter," 1882, many details concerning the commonest mistakes in taking up initial positions can be found (part i. "Branting's terminologie," pp. 1-115, *et seq.*). *See also* Silow's "Handbok i gymnastik för Arméen och Flottan," 1902, vol. i.

trunk and limbs as much as possible, this is not a position of perfect rest; but it is so in medical gymnastics where no such stretching is needed.[1]

FIG. 1.

FIG. 2.

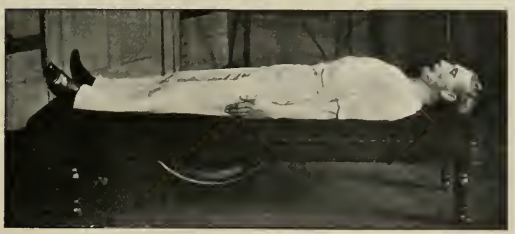

FIG. 3.

(4) *Kneeling position.*—In pedagogical gymnastics the subject assumes the position on the floor, kneeling so as to rest on knees and toes, the ankle joints being fully extended. In medical

[1] *Cf.* Wide's "Handbok i Medicinsk Gymnastik," 1895, p. 14. Wide's "Handbook of Medical Gymnastics," 1899, p. 13. Wide's "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 14. Wide's "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 2. *See also* Frode Sadolin, "Liggande grundställning som hvilestilling" in *Tidskrift i Gymnastik*, 1902, p. 341, &c.

gymnastics, however, the patient assumes this position on a couch, resting on knees and insteps, so that the toes hang over one end (fig. 4).[1]

(5) *Hanging position.*—The patient is suspended by the arms, which are stretched vertically upwards; the palms look forwards and grasp a horizontal beam (fig. 5).

II.—Secondary Positions.—By these are meant positions derived primarily from the fundamental ones or secondarily from one another, by causing the arms, legs, head or trunk, either one or several, in whole or in part, to assume certain new positions, the rest of the body being kept in its original posture.

Terminology.—It is, of course, necessary to have some brief method of naming these new positions. It would obviously be cumbrous and unpractical to say "the arms-stretched-vertically-upwards-feet-two-foot-lengths-apart-sideways-trunk-and-head-as-before position." In order to abbreviate as much as possible and yet to give a clear idea of what is referred to, the following arrangement is the one that is generally adopted:—

Firstly, the change (if any) in the position of the arms is indicated; and in the example just given the one word "stretch" would be used to replace the four words "arms stretched vertically upwards." Secondly, the change (if any) in the position of the legs is added, in this particular case the word "stride"; thirdly, the change (if any) in the position of the trunk; and lastly, the original position in which the body was placed before these changes were brought about. Thus the example given above would be expressed clearly and concisely by the term "stretch stride standing."

Any such terminology must sound strange at first, but it is after all the best, being the most succinct and the most definitive. It was invented by Branting, who worked it out some seventy years ago at P. H. Ling's instigation, and under his supervision, to replace the old terminology which was longer, somewhat cumbrous, and often quite ambiguous.

In the following account of the secondary or derived positions

[1] This method of assuming the kneeling position gives much greater security of balance than the one advocated by Wide, in which the patient is supported only by the knees and legs. *See* Wide's "Handbok i Medicinsk Gymnastik," 1895, p. 15. "Handbook of Medical Gymnastics," 1899, p. 14. "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 15. "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 129.

only the parts specially concerned will be referred to; it must be taken for granted that the position of the rest of the body is strictly the same as in the original position from which the new one is derived.

Fig. 4.

Fig. 5.

(A) Positions derived from the Standing Position.

I.—*By Moving the Arms.*

(1) *Hips firm, or wing, standing.*—The hands are placed on the hips so that the palms rest against the crests of the ilia with the fingers anteriorly and the thumbs posteriorly; the elbows and shoulders are well drawn back (fig. 9).

(2) *Bend standing.*—The arms are bent by flexion at the elbows; the forearms are in extreme flexion and supinated; the wrists and fingers are somewhat flexed and the latter touch

the upper arms in front of the head of the humerus. The upper arms are to some extent externally rotated (fig. 6).

(3) *Swim standing.*—The arms are placed in front of the chest just as in the first position of swimming. The upper arms are abducted to a right angle, and the elbows kept well back; the forearms are in extreme flexion and also horizontal; the palms of the hands look directly downwards (fig. 40).

FIG. 6.

FIG. 7.

(4) *Heave standing.*—The upper arms are stretched horizontally outwards; the elbows are flexed to a right angle, so that the forearms and fingers point vertically upwards, and are either supinated, in the mid-position, or pronated, *i.e.*, the palms either look directly inwards, directly forwards, or directly outwards (fig. 19).

Heave lean standing.—"Lean" means that some part of the body rests against some fixed apparatus for support. In

this case support is obtained by means of two vertical poles, or some such apparatus, against which the forearms and hands rest; to allow of this the former must be in the mid-position (fig. 63).

Heave grasp standing.—"Grasp" means that the hands grasp some fixed apparatus in order to obtain support. This position is the same as the last, excepting that the hands grasp the poles instead of merely resting against them (fig. 77).

In both heave lean, and heave grasp positions the individual should lean forwards a little in order to expand his chest better.

(5) *Stretch standing.*—The arms are stretched vertically upwards, and are kept parallel, with the palms of the hands looking towards one another (fig. 7).

Stretch grasp standing is the same as the previous position, but the hands grasp either the rung of a ladder placed at a suitable height, or else two vertical poles. This position may also be called stretch span standing (fig. 59).

Stretch grasp side standing.—The patient stands sideways against a ladder; the arm nearest to it is stretched vertically downwards and grasps one of its rungs. The outer arm is stretched upwards and somewhat inwards, and also grasps a rung (fig. 60). This position is often called side span standing.

(6) *Reach standing.*—The arms are stretched horizontally forwards and lie parallel; the palms of the hands look directly towards one another (fig. 58).

Reach grasp standing is the same as the last, excepting that the hands grasp a suitable support, such as the rung of a ladder (fig. 81).

(7) *Yard standing.*—The arms are stretched horizontally outwards, or even a little backwards, the palms of the hands look either directly downwards, directly forwards, or directly upwards (fig. 8).

(8) *Neck firm, or rest, standing.*—The hands are placed behind the neck, the elbows are flexed and kept well back, the forearms are pronated; the fingers rest on the lower part of the occipital bone, just about the protuberance (fig. 37).

In many duplicate movements this position is difficult to maintain, the head and elbows having a strong tendency to come forward. This can be remedied by letting the patient place his fingers over the posterior part of the parietal bones; much of the exertion which was necessary before is eliminated by so doing.

FIG. 8.

FIG. 9.

FIG. 10.

II.—*By Moving the Legs.*

(1) *Toe standing.*—From the fundamental position the patient raises himself on tiptoe, keeping his heels together. The trunk and legs, moving as a whole, must come forwards a little, so as to preserve the equilibrium.

(2) *Knee bend toe standing.*—From the toe standing position the knees are bent outwards until the thigh and lower leg are at right angles (fig. 9).

(3) *Walk standing.*—One foot is placed two foot lengths directly forwards; the trunk passes forwards so as to rest equally on both feet (fig. 10).

Hip lean walk standing is the same as the last, excepting that support is granted to one side between the great trochanter and crest of the ilium by means of a bar or other suitable support placed horizontally and parallel to the sagittal plane. The support should be on that side on which the foot is anterior (fig. 37).

(4) *Stride standing.*—The feet are placed sideways two foot lengths apart, the weight of the body resting equally on both (fig. 7).

Loin lean stride standing is the same as the last, excepting that the upper sacral region rests against a bar or other suitable support placed horizontally and parallel to the coronal plane (fig. 38).

Leg lean stride standing.—The patient is in stride standing position; his feet are fixed and the front of the upper thirds of his thighs rest against a bar also placed horizontally and parallel to the coronal plane.

(5) *Step standing.*—One foot is placed on the rung of a ladder or some other suitable support, the hip and knee joints of that side being flexed to about a right angle.

Instead of being merely flexed, the thigh may be rotated externally and abducted as well.

III.—*By Moving the Trunk.*

(1) *Arch standing.*—The spinal column in its dorsal and cervical regions is extended backwards on itself; naturally the pelvis must be carried slightly forward in order to preserve the equilibrium.

Head lean arch standing.—Standing with his back towards a wall, one foot length from it, the patient arches his back as just described until his head rests against the wall (fig. 35).

(2) *Side bend standing.*—The trunk is flexed laterally well over to one side, care being taken to protrude neither shoulder nor hip (fig. 36).

(3) *Turn standing.*—The trunk is rotated to one side on its long axis, care being taken to move the hips as little as possible.

Loin lean turn standing.—The sacrum is supported as already described in order to fix the hips better. The feet are usually placed as for stride position; this results in loin lean stride turn standing position (fig. 46).

(4) *Stoop falling* (also called stoop fall standing).—The whole body leans forwards, the hands are in reach position, either leaning against or grasping a support so as to maintain the immovable position (fig. 17).

(B) Positions Derived from the Sitting Position.

(*a*) *Low sitting.*—The patient sits on a low chair.

(*b*) *High sitting.*—The patient sits on a high chair.

Both of these variations are merely for the convenience of the assistant.

I.—*By Moving the Arms.*

(1) Hips firm sitting, (2) swim sitting, (3) heave sitting, (4) stretch sitting, (5) reach sitting, (6) yard sitting, (7) neck firm sitting; the particulars of which can be grasped without difficulty from the descriptions already furnished of the corresponding standing positions. In any of them the patient may, if necessary, have his back supported.

II.—*By Moving the Legs.*

(1) *Ride sitting.*—The patient sits astride on a chair or couch, his feet resting on the ground or some other support. The feet and knees, or only the former, may have to be fixed to ensure stability (fig. 39). This position may also be called simply "riding."

(2) *Stride sitting.*—This usually replaces the ordinary sitting position in order to secure better balance by means of a larger

area of support. The feet are kept well apart, and the lower legs perpendicular (fig. 19).

III.—*By Moving the Trunk.*

(1) *Sit lying.*—The head, trunk, and thighs are as in the fundamental lying position; the knees are flexed to a right angle, and the lower legs hang over the edge of the couch on which the position was assumed (fig. 11).

Fig. 11.

(2) *Fall sitting.*—The trunk and head are kept midway between sitting and sit lying positions, thus forming an angle of about 135° with the thighs anteriorly. The lower legs must be fixed (fig. 33).

(C) Positions Derived from the Lying Position.

I.—*By Moving the Arms.*

(1) Hips firm lying; (2) Heave lying; (3) Stretch lying; (4) Neck firm lying, &c., the particulars of which can be grasped without difficulty from the descriptions already furnished of the corresponding standing positions.

II.—*By Moving the Legs.*

Crook lying.—The patient's trunk and head are as in lying position; the knees are drawn up with the heels resting on the couch (fig. 12).

Fig. 12.

III.—*By Moving the Trunk.*

(1) *Half lying.*—The patient reclines backwards on a couch, so that while the legs are horizontal, the trunk and head form an obtuse angle with the legs. The angle may be increased or diminished according to circumstances (fig. 41).

From this may be derived hips firm, stretch, heave, &c., half lying position according to the placing of the arms.

(2) *Crook half lying.*—Is a combination of crook lying and half lying position. In some cases the hip-joints, instead of merely undergoing flexion, may, in addition, be externally rotated and abducted; *i.e.*, the knees are separated (fig. 13).

Fig. 13.

(3) *Forwards lying.*—The patient lies prone with face downwards and spinal column arched, supporting the latter with the forearms (fig. 14).

Fig. 14.

Arch forwards lying.—The patient's feet are first fixed by the assistant; the former then arches the spinal column backwards (extends it on itself) as much as possible; the arms are usually in hips firm position (fig. 34).

(4) *Side lying.*—The patient lies on one side on a couch fig. 15).

Fig. 15.

Stretch side lying is the same as the last, excepting that the uppermost arm is in stretch position, *i.e.*, in right side lying the left arm is moved, and *vice versâ*.

(D) Positions Derived from the Kneeling Position.

I.—*By Moving the Arms.*

Such positions result as neck firm kneeling, &c.

II.—*By Moving the Legs.*

There is only one in ordinary use, *i.e.*, stride kneeling, which,

from the greater security of balance afforded by it, in practice entirely replaces kneeling position. The knees are separated by about a foot's length, but the heels are kept together as before (fig. 84).

III.—*By Moving the Trunk.*

Such positions result as turn kneeling, side bend kneeling, &c.

From the foregoing an innumerable number of other secondary positions may be derived by the simple process of combination, such as stretch arch forwards lying, neck firm loin lean stride turn standing, &c.

CHAPTER IV.

GENERAL PHYSIOLOGICAL EFFECTS OF ACTIVE AND PASSIVE MOVEMENTS.

(A.)—Physiological Effect of Purely Active Movements.

Purely active movements are seldom prescribed in Kellgren's treatment, as in almost all cases a greater effect can be obtained by substituting the corresponding duplicate exercises; and it is unnecessary to describe the physiological effects of the former, as they are in a lesser degree much the same as those of the latter. Should, however, no corresponding duplicate form be in ordinary use, the effects of the purely active movement will be described in the proper place immediately after the description of the movement itself.

(B.)—Physiological Effect of Duplicate Movements.

This part of the subject will be treated in considerable detail, and the advantages possessed by duplicate movements over the ordinary purely active ones clearly pointed out.

Special effects of the "traction."—The effects of the traction applied in every duplicate movement are as follows :—

(1) The muscles are rendered capable of doing more work; because the more a muscle is elongated within its physiological limit the greater becomes its absolute power.

(2) There is increased absorption by the lymphatics, due to the stretching of the vessels themselves as well as of the fasciæ, tendons, ligaments, &c., of the part. In all the structures just mentioned there are two sets of these lymphatics, a deep set, and a superficial set, connected by small branches. The slightest pressure or stretching of the tendons, &c., causes a flow of lymph from the deep into the superficial set, the latter in their turn discharging their contents into the larger lymphatic trunks. On removal of the pressing or stretching force, new lymph is sucked

from the tissues into the deep set, and so on.[1] (Ludwig and Schweigger-Seidel).[2]

(3) The longitudinal blood-vessels are elongated; the veins, therefore, have their actual capacity increased, and a suction power arises in them (see also page 30).

(4) The absolute range of mobility of joints is in some cases increased. The opposing articular surfaces are separated from one another,[3] or their mutual pressure diminished, by a withdrawing of the elastic tension of the muscles and ligaments, and thus any pain from inflammation, friction, &c., is reduced to a minimum. The ligaments are elongated and stimulated.

(5) The nerves become stimulated by means of moderate elongation. This is one of the most important effects. Although many physiologists had experimented on the effect of elongation of nerves before[4] Tigerstedt did so, I think I am right in saying that he was the first to clearly demonstrate that a slight amount of stretching greatly increased the excitability of a nerve, whereas a considerable amount did the opposite.[5] His results have since been confirmed by other observers.

Effects on Different Parts of the Organism.

I.—*Blood-Vessels and Blood.*

(1) *In the case of a concentric movement.*—Physiologists are not quite agreed as to the precise nature of the sequence of events resulting in the circulation of the blood during and after muscular contraction, but the following as nearly as possible represents their general opinion:—

(*a*) In the contracting muscles. The longitudinal blood-vessels, arterial and venous, are shortened, and all the vessels of the part subjected to pressure by the contracting muscles. The first effect on the arteries is an increase in the velocity of their contents, the *vis a tergo* preventing movement in the opposite direction. The first effect on the veins is a considerable diminu-

[1] In medicine a good deal is heard about vicious circles; in gymnastics, as in this particular case, instances frequently arise of dealing with beneficial ones.

[2] "Die Lymphgefässe der Fascien und Sehnen," 1872. *See also* p. 32.

[3] The amount of force necessary to separate the articular surfaces differs, of course, in different joints. According to Haycraft, for the hipjoint the amount is about 20 kilos., for a metacarpo-phalangeal joint, about ½ kilo. (*Cf.* Schäfer, "Textbook of Physiology," vol. ii., 1900, pp. 234, 235.)

[4] A list of the literature of the subject can be found in Stintzing's "Über Nervendehnung," 1883.

[5] "Studien über Mechanische Nervenreizung," 1880, pp. 39, &c.

tion in their volume, their contents being sent on in a spurt towards the heart. As contraction proceeds, a rise in the local arterial resistance takes place, and the contents of the inter- and intra-muscular veins are squeezed into the larger trunks. As soon as relaxation takes place, or even in some cases during the last part of the contraction, there is a considerable vaso-dilatation of the arteries, arterioles, and capillaries, and thus more blood will flow to, through, and from the contracting muscles in a unit of time.[1] In consequence of this dilatation the local peripheral resistance, which is chiefly arteriolar (Foster,[2] Campbell,[3] Oliver[4]), is greatly reduced, and the capillary pressure rises above what it was before the muscle began to contract. The circulation through the muscle becomes much more lively, and the metabolism of the muscle is greatly increased; this effect passes off gradually, although it may often be noticeable for an hour or more.[5]

[1] This was known practically by the Ling school before it was proved by physiologists. P. H. Ling speaks of derivative or depleting exercises in "Gymnastikens Allmänna Grunder" (1834) 1840, pp. 153, 159, &c. (*see* p. 31). *See also* Sondén, "Tankar öfver Praktisk Medicin," in *Hygeia*, March, 1840, p. 119; the works of Neumann, Rothstein, &c.

[2] "Textbook of Physiology," 1891, p. 209.

[3] "The Resistance to the Blood-flow," in *Journal of Physiology*, 1898, vol. xxiii., pp. 301-309.

[4] "The Blood and Blood Pressure," 1901, pp. 141, 142.

[5] The foregoing facts are taken from: —Cl. Bernard, "Leçons sur les propriétés physiologiques et les altérations pathologiques des liquides de l'organisme," 1859, p. 325, &c. Sczelkow, "Zur Lehre vom Gasumtausch in verschiedenen Organen," in *Zeitschr. für Rat. Med.*, 1863, vol. xvii., pp. 106, 122, &c., also in "Sitzungs Berichte der Akad. d. Wissensch. Math-Naturw. Kl.," vol. xiv., Zweite Abtheilung, pp. 471, &c. Sadler, "Über den Blutstrom in den ruhenden, verkürzten und ermüdeten Muskeln des lebenden Thieres," in *Arbeiten a. d. Phys. Anst. zu Leipzig*, 1869, pp. 77-100. Hafiz, "Über die motorischen Nerven der Arterien, welche innerhalb der quergestreiften Muskeln verlaufen," in *Arb. a. d. Phys. Anst. z. Leipzig*, 1870, pp. 95-112. Ranvier, "Note sur les vaissaux sanguins et la circulation dans les muscles rouges," in *Archives de Phys.*, 1874, p. 448. Gaskell, "Über die Änderungen des Blutstroms in den Muskeln durch die Reizung ihrer Nerven," in *Arb. a. d. Phys. Anst. zu Leipzig*, 1876, pp. 45-88; also "Further Researches on the Vaso-motor Nerves of Ordinary Muscles," in *Journal of Phys.*, vol. i., 1878, pp. 262, &c. Mosso, "Sulle variazioni locali del polso nell' antibráccio del uomo," 1878. Marey, "La Circulation du Sang," 1881, pp. 343, &c. Humilewski, "Über den Einfluss der Muskelcontraction der Hinterextremität auf ihre Blutcirkulation," in *Arch. f. Anat. u. Phys., Phys. Abth.*, 1886, p. 126. Spaltholz, "Die Gefässvertheilung im Muskel," *Abhandl. der Königl. Sächs. Gesellsch. zur Wissensch.*, 1888, No. 11. Kaufmann, "Recherches expérimentales sur la circulation dans les muscles en activité physiologique," in *Archives de Phys.*, 1892, p. 279. Hasebrock, "Die Gymnastische Widerstandsbewegungen in der Therapie der Herzkrankheiten," 1895. Brunton and Tunnicliffe, "Remarks on the Effect of Resistance Exercises upon the Circulation in Man, local and general," in *Brit. Med. Journ.*, 1897, vol. ii., pp. 1073, &c. Oliver, "The Blood and Blood Pressure," 1901. Heilemann, "Das Verhalten der Muskelgefässe während der Contraction," in *Arch. f. Anat. u. Phys., Anat. Abtheil.*, 1902, pp. 45, &c. *See also* literature on p. 30.

Sadler[1] made the interesting observation that if resistance is offered to a contracting muscle so as to prevent its shortening, considerably more blood passes through it in a unit of time than if it is allowed to contract without an opposing force. This is in all probability due to stimulation of the muscle to do more work by the resistance offered (isometric contraction), and because the effect of the mechanical pressure through shortening and increase in the sectional area of the muscle is largely eliminated.

The relative amounts of blood in resting and active muscle have been varyingly estimated. Ranke[2] stated them to be as about 36·6 per cent. and 66 per cent. respectively of the total blood quantum; Spehl[3] as 0·327 to 0·343 and 0·520 to 0·664. Kaufmann[4] found from three to five times as much blood flow through a muscle during activity as during rest; Hill and Nabarro[5] found the same. See also Oliver.[6]

The venous flow is in many places promoted by the existence of special anatomical mechanisms which aid it. In most of the joints of the body, but especially at the hip, knee, shoulder, and lower part of the neck, the veins are attached to tendon sheaths, fasciæ, &c.; the latter are stretched in many movements, and thus the walls of the veins are opened out and a suction power is set up in them. (This is quite apart from the one induced by respiration.) When the fasciæ, &c., are relaxed the veins have their lumen diminished, and their contents are sent on towards the heart, the valves preventing any reflux[7] (Braune,[8] Herzog[9]). The importance of the suction power in the veins is still further increased by

[1] "Über den Blutstrom in den ruhenden, verkürzten und ermüdeten Muskeln des lebenden Thieres," in *Arbeiten an der Phys. Anst. zu Leipzig*, 1869, p. 77.

[2] "Die Blutvertheilung und der Thätigkeitswechsel der Organe," 1871, p. 88.

[3] "De la réparition du sang circulant dans l'économie," Thèse, Bruxelles, 1883.

[4] "Recherches expérimentales sur la circulation dans les muscles en activité physiologique," in *Arch. de Phys. normale et pathologique*, 1892, p. 283, &c.

[5] "On the exchange of Blood Gases in Brain and Muscle during states of rest and activity," in *Journal of Physiology*, 1895, vol. xviii., p. 218.

[6] "The Blood and Blood Pressure," 1901, p. 157.

[7] This was known and practically demonstrated by the Ling school years before its actual demonstration by Braune. (*See* Hj. Ling in Branting's "Efterlemnade Skrifter," 1882, p. xxx.).

[8] "Die Oberschenkelvene in anatomischer u. klinischer Beziehung," 1873.

[9] "Beiträge zum Mechanismus der Blutbewegung an der oberen Thoraxapertur beim Menschen," in *Deutsche Zeitschrift fur Chirurgie*, 1881, vol. xvi., pp. 1-30.

the fact that in most places where such mechanisms exist the number of venous tributaries greatly exceeds the corresponding number of arterial stems (Braune[1]). In all sites where muscles by their contraction compress the veins and thus further their flow in a centripetal direction, these vessels are arranged in pairs, one on each side of its artery (Braune[1]).

(*b*) In the antagonistic muscles. The longitudinal vessels are elongated; thus the veins have their actual capacity increased, and a suction power is set up in them. The circulation, both venous and arterial, will thus be hastened.

(2) *In the case of an excentric movement.*—(*a*) In the contracting muscles. The effects will be nearly similar to those taking place in the case of a concentric movement, but there is hardly any rise in the local arterial resistance, and probably vaso-dilatation, instead of only occurring after the contraction, commences together with it.

(*b*) In the antagonistic muscles. The shortening of the longitudinal veins causes a diminution in their volume; thus their contents are driven on towards the heart.

From the above details it is clear that, in giving a duplicate exercise, blood will be drawn to the muscles that are active, and this must be compensated for by less blood in some other muscle or organ. In gymnastics movements that draw away blood are called "depleting" or "derivative"; thus exercising both arms and both legs causes depletion of the trunk.[2]

Depleting effects may be brought about in large or in small areas; in illustration of the second it may be stated that, as a general rule, exercises entailing action of the abductors of the thigh cause depletion of the pelvic organs. Clinical experience tends to show that after depletion of a part a reaction sets in, which is complete in normal states, but only partial in pathologically inflamed, hyperæmic, or congested states; thus improvement results.

Effect of active movements on the blood itself.—The majority of observers are agreed that all muscular exercise, whether active or passive, causes an increase in the percentage of the red

[1] *Op. cit.*, p. 9.

[2] P. H. Ling makes several references to such depleting (called "afledande" in Swedish) movements in "Gymnastikens Allmänna Grunder" (1834), 1840.

corpuscles. (Malassez,[1] Winternitz,[2] Mitchell,[3] Chéron,[4] Oliver.[5] *Cf.*, however, Edgecombe.[6])

II.—*Lymph.*

Normally in a part at rest there is very little flow of lymph, some authorities say none at all (Starling[7]), but both active and passive movements increase its production and favour its flow, as first shown by Genersich,[8] Lesser,[9] and Paschutin,[10] in Ludwig's laboratory. The special mechanisms that exist in the anatomical arrangement of the lymphatics have been referred to on pp. 27, 28.

III.—*Cerebro-spinal System.*

The nerves, and in a few cases the spinal cord, are stimulated from their alternate elongation and shortening. In addition to this we have the fact that every voluntary gymnastic exercise calls into play a nervous sensory motor circuit (see passive movements, p. 39). The sensory portion is composed of the afferent nerves (chiefly those of the muscles) in the lower, and to a less extent the upper, neuron; the motor portion of the circuit is

[1] "De quelques variations de la richesse globulaire chez l'homme sain," in *Comptes rend. de la Soc. de Biol.*, séance du Oct. 31, 1874, and in *Gaz. Méd. de Paris*, 1874, p. 573, &c.

[2] "Neue Untersuchungen über Blutveränderungen nach thermischen Eingriffen," *Centralbl. für Klin. Med.*, 1893, vol. xiv., pp. 1017-1022.

[3] "Preliminary Note on the Effect of Massage on the Blood Count," in *Med. News*, Philad., 1893, p. 715; "Notes on the Effect of Massage on the Blood Count," in *College of Physicians*, Philad., 1893, third series, vol. xv., pp. 240-242; "Effect of Massage on the Number and Hæmoglobin Value of the Red Blood Cells," in *American Journal of the Med. Sciences*, Philad., 1874, new series, vol. cvii., pp. 502-515; "Über die Wirkung der Massage auf die Blutverschaffenheit," *Pester Med. Chir. Presse*, 1894, No. 15.

[4] "Hyperglobulie instantanée par stimulation périphérique; conséquences," in *Compt. rend. de l'Académie des Sciences*, 1895, tome ii., No. vi., p. 314.

[5] "The Blood and Blood Pressure," 1901, pp. 45, &c.

[6] "The Effect of Exercise on the Hæmoglobin with Reference to the value of Rest in the Treatment of Anæmia," in *British Medical Journal*, June 25, 1898.

[7] "On the Physiological Factors involved in the Causation of Dropsy," *Lancet*, May 9, 1896, &c.

[8] "Die Aufnahme der Lymphe durch die Sehnen und Fascien der Skeletmuskeln," *Arb. a. d. Phys. Anst. zu Leipzig*, 1871, p. 51, &c.

[9] "Eine Methode um grosse Lymphmengen vom lebenden Hunde zu gewinnen," *Arb. a. d. Phys. Anst. zu Leipzig*, 1872, p. 94.

[10] "Über die Absonderung der Lymphe im Arme des Hundes," in *Arb. a. d. Phys. Anst. zu Leipzig*, 1873, pp. 197, &c.

composed of that portion of the brain in which are localised the highest mental centres, and the upper and lower neurons, with the physiological paths of continuity between them. The improved circulation in the exercised parts will bring more nutrient matter to the peripheral part of the lower neuron (perhaps also to the other portions of the motor path), thus stimulating it.

There is, in fact, an educative effect on the nervous mechanism, a fact recognised very early by the pioneers of Ling's system,[1] who regarded all muscle gymnastics as being nerve gymnastics as well.

Duplicate movements thus help to train the individual to place his body better under the influence of his will. By their means he learns to specially concentrate his energy on the muscles called into action, and to inhibit all others from working. Thus an education of the muscular sense, powers of inhibition, and also of the sense of coördination ensues.

There is, in addition, an effect on the moral and mental faculties; this has been discussed, amongst others, by Hartelius.[2]

IV.—*Heart.*

In ordinary life, any exerting movement tends to accelerate the cardiac action in consequence of temporary increased peripheral resistance, due to pressure on the vessels by both the muscles acting on the joint moved and those which fix the joints above and below it. The accompanying tendency to hold the breath and thereby increase the intrabronchial pressure (Sommerbrodt's[3] reflex), also acts in exciting the heart.

But with properly arranged duplicate movements, given so as to successively exercise the various peripheral parts of the body, the action of the patient's fixators is eliminated, and in consequence the patient is enabled to concentrate more energy on the group of muscles under treatment. And in medical

[1] *Cf.* P. H. Ling, "Gymnastikens Allmänna Grunder" (1834), 1840, pp. 151, &c. Georgii, "Kinésithérapie," 1847; "Kinetic Jottings," 1880, pp. 36, 38, 45, 47, 57, &c. Hj. Ling, "Förkortad Öfversigt af Allmän Rörelselära," 1880, pp. 51, 53, and his preface to Branting's "Efterlemnade Skrifter," 1882, pp. xviii. *et seq.*

[2] "Kroppsrörelsers inflytande på det andliga lifvet," in *Tidskrift i Gymnastik*, vol i., 1879, pp. 688-690. "Lärobok i Sjukgymnastik," 1883, p. 140, 1894, pp. 138, 139.

[3] "Über eine bisher nicht gekannte wichtige Einrichtung des menschlichen Organismus," 1882.

gymnastics a patient is never allowed to forcibly hold the breath during the execution of any movement (see p. 124). After the conclusion of the movements there will be a fall in the general arterial resistance.

Therefore, not only are practically eliminated all the factors which, acting together, increase the cardiac action, but there is also introduced into the blood vascular system a kind of peripheral pump which relieves the heart of part of its work.

Even if a slight increase in the cardiac work results during the giving of the movements, this acts beneficially, unless in cases of extreme weakness of the heart. This is because the heart has (excepting in the case just mentioned) a certain amount of reserve power which is thus partially called into play. The heart, therefore, having received the impulse to better action in consequence of increased resistance, is enabled to act better still when the latter is reduced below its original amount.

V.—*Muscles.*

As already stated on p. 11 the resistance offered to the patient's efforts is so graduated as to permit of the maximum effect desirable being obtained. It is also known that the greater the force (within physiological limit) opposed to a contracting muscle, the more will that muscle try to overcome it.

In this way is obtained the maximum of increased growth and activity; there is increase in the size of the individual fibres, and, consequently, of the muscle as a whole, and increase in its active constituents; the muscle works with greater speed, certainty and force; its tonicity during rest is in a better condition and its attachments to bones, &c., become stronger.

Changes in the circulation in active muscles during and after contraction have been already referred to on pp. 28, &c.

The same muscles are exercised if a movement is first executed concentrically and then the reverse movement excentrically; antagonistic groups of muscles are exercised if the same movement is executed first concentrically and then excentrically. In the case of a duplicate concentric exercise the active muscles are shortened and their antagonists are passively elongated.[1] In the case of a duplicate excentric exercise the former are elongated

[1] *See* Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, p. 218.

and the latter passively shortened. Thus the muscular force is greatest at the beginning and least at the end in the case of a concentric movement; the reverse, however, holds good in the case of an excentric movement.

Every active movement, whether given with or without resistance, has a standard rate of execution, which is such that the maximum physiological effect may be produced. (This rate is, of course, modified to suit different patients and the nature of the malady under treatment.)

An increase in muscle energy implies the using up of more sugar; thus an increase would result in the glycogenic function of the liver.

VI.—*Joints and Ligaments.*

The joints are exercised, rendered more supple and become stronger; the latter is due to the strengthening of the ligaments and muscles that surround them. In most cases elasticity in the ligaments acts as a substitute for muscle power, and in nearly all joints the tendons themselves act as ligaments. In consequence of the vaso-dilatation the nutrition of the bones and ligaments is promoted.

The final result of duplicate movements on joints is to restore their normal articular function, and in some cases such movements can be used to increase the amount of synovial fluid in conditions of insufficiency thereof; in other cases, however, they can be used to promote the absorption of pathological excess. Duplicate movements also tend to break down and remove any stiffness, adhesion or deposits (gouty or otherwise) in the joint or in the periarticular tissues.

VII.—*Respiration.*

Duplicate movements, properly arranged, tend to make respiration deeper and slower after their execution. This is caused by: (*a*) The strict enforcement of the rule that deep and full respiration is to take place during all such movements. (*b*) Stimulation of the respiratory centre by the metabolites.

VIII.—*The Metabolism of the Body as a Whole.*

This tends to be increased with beneficial effect, and thus the demand for more nutrient matter increases. There is in consequence an increase in the excretions.

Some of the above effects are immediate, coming either during the performance of the movement or just after it. Others, on the contrary, for example, the educative effect on the brain, may not be apparent until a number of days, or even weeks, has elapsed.

Duplicate movements have many distinct advantages over purely active ones, as follows:—

(1) Groups of muscles, or even individual muscles (in rare cases actually part of one muscle) can be isolated by eliminating the co-action of their antagonists, and also of the muscles that fix the joints above and below the one that is being exercised. Thus the patient is enabled to concentrate all his available energy on that group or individual muscle.

(2) Contraction can be brought about very early in apparently totally paralysed muscles, and some patients can perform duplicate excentric movements sooner than they could the corresponding purely active ones in which the same muscles would be called into action.

(3) The work done by the patient can be graduated to any amount desirable.

(4) By means of isolation it is possible to draw blood to or from almost any part of the body desired.

(5) Time is gained by concentrating the maximum effect into the minimum duration.

(6) As the traction, by separating the opposing surfaces of a joint, to a great extent eliminates pain due to interarticular friction, it is found that patients can often be enabled to perform strong duplicate movements, concentric as well as excentric, whereas they could not or would not perform the corresponding purely active ones because of the great pain that would inevitably arise.

(7) There is obtained the extra stimulatory effect of the traction applied.

Apart from their therapeutic value in the treatment of diseases, duplicate movements are of great interest from a purely anatomical point of view. By means of the fact that the maximum amount of work is obtained from the muscles, and also from the circumstance that the latter can be so readily eliminated and their action isolated, duplicate movements afford one of the best methods for studying muscular actions and

relative strengths. Therefore duplicate movements are invaluable as a diagnostic method for determining the presence or absence of paresis or paralysis.[1]

It is necessary to refer in greater detail to No. (1) above. In the case of all active exercises there must be a fixed point for the movement to start from—*i.e.*, the patient must fix his trunk in arm movements, his lower leg in foot movements, and so on, using in order to effect this his own muscles; the latter, however, can be thrown out of action by fixing the part in question for him. For example, if a patient be asked to abduct his arm to a right angle, and keeping it there to alternately flex and extend his wrist with resistance applied by the assistant over the palm and corresponding dorsal aspect of the metacarpus respectively, it will be found that he can exert very little force in the execution of the movement, as any greater effort would prevent him from keeping the elbow and shoulder joints immovable. If, however, his upper arm be fixed, he will be able to exert much more force in executing the movement, having only to fix his elbow joint. If, finally, his forearm be fixed, it will be possible to obtain the maximum amount of work from the flexors and extensors of his wrist, for he is then able to concentrate without any waste the whole of his available energy on these muscles.

The mechanical conditions to be dealt with in all duplicate movements are those peculiar to a lever. The fulcrum of the lever is the joint at which the movement takes place, and the forces acting are, firstly, the patient's muscles, and, secondly, the opposing muscles of the assistant. The point of application of the assistant's force should therefore, under ordinary circumstances, be removed as far as possible from the joint that is to be moved. By means of such increased leverage he lessens his own exertions, and is consequently better enabled to modify his powers to suit the phase of the movement, and also obtains a better command over the part moved.

The contrary, however, must be said respecting cases in which it is desired to have absolute control of only one joint, such as in paralysis, synovitis, &c. In such conditions the outside force is often advantageously applied as near as possible to the insertion of the muscle it is attempted to stimulate, because thus the

[1] *See* part ii., chap. i.

proportion of the patient's force as compared with the assistant's becomes relatively greater. By these means the patient is made conscious as early as possible of possessing the power of voluntary movement. This method is also of importance, because there is more complete isolation of the muscle in question, and because the effect of the traction applied is wholly transmitted to the joint exercised, instead of being expended in part on other joints below it.

(C)—*Physiological Effect of Passive Movements.*

I.—*Passive movements at joints.*—With all these, where possible, traction of the part is maintained just as in duplicate movements. The effects of this traction have been considered already. In addition there are the effects of the movement itself, which vary very greatly according to the manner in which it is given, as follows:—

(1) When the movements are given energetically and through a large radius. The effects are on the same lines as those induced by duplicate movements, only, of course, not so marked, as follows:—

(*a*) Stimulation of the muscles from their alternate elongation and shortening.

(*b*) Vaso-dilatation and increase in the amount of blood in the part exercised in consequence of general stimulation.

(*c*) Furthering of the circulation of the blood.

(*d*) An effect on the blood itself (see p. 31).

(*e*) Increased production of lymph and furthering of its flow, facts which, though known practically to and clinically demonstrated by the Ling school many years ago,[1] were not actually shown by experiment until Genersich,[2] Lesser,[2] and Paschutin[2]

[1] *See* Georgii, "Kinésithérapie," 1847, p. 34. Rothstein, "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen P. H. Ling," 1847. Richter, "Organon der Physiologischen Therapie," 1850, p. 209. Neumann, "Die Heilgymnastik," 1852, pp. 34, &c. Eulenburg, "Die Schwedische Heilgymnastik," 1853, pp. 99, 123. Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, p. 139. Lovén, "Om Väfnadssaften i dess förhållande till Blod och Lymphkärl" in *Hygiea*, Feb., 1875, pp. 80-93. Hartelius, "Om Resorbtionsrörelsers Uppkomst och Verkan," in *Tidskrift i Gymnastik*, 1876, part 7, pp. 253, &c. Hj. Ling in Branting's "Efterlemnade Skrifter," 1882, pp. xxix., xxx.

[2] *Op. cit.*, *see* p. 32.

did so in Ludwig's laboratory. (See also the researches of Ludwig and Schweigger-Seidel[1] and Lassar.[2])

(*f*) Increased suppleness of joints; while any adhesions, stiffness, deposits, &c., will tend to be overcome and dissipated.

(*g*) Stimulation of the nerves from alternate elongation and shortening, and from the improvement in the circulation in the blood. The elongation of the nerves through elongation of the muscles stimulates the reflex spinal arc, and this is further reinforced through shortening of the antagonists, as shown by Sherrington.[3] Passive movements thus stimulate the afferent nerves (chiefly those of the muscles) and the efferent nerves of the lower neuron, possibly, also, those of the upper neuron.

(*h*) An increased feeling of warmth and an actual rise in the temperature of the part.

(2) When the movements are given slowly through a large radius. The effects are in kind the same as before, but the slowness of the movement gives rise to less stimulation of the nerves and muscles, and the amount of blood flowing to the latter is not increased to so marked a degree.

(3) When the movements are given gently through a small radius.

The effect on the muscles and nerves is very small. In cases where there is a tendency to, or an actual presence of, a hyperæmic or congested state in the part manipulated, the latter will improve, for the venous return will proceed faster than the arterial flow. This is because:—

(*a*) There is practically no vaso-dilatation, the stimulatory effects being very small.

(*b*) The veins, lying as they do more superficially, are elongated and shortened more than are the deeper-lying arteries, as the movement stretches and relaxes the superficial parts to a greater extent than the more central ones of the part in question.

(*c*) The number and size of the veins is usually greater than that of the arteries; in the body, as a whole, the ratio of their respective capacities is about 9 : 4.

The lymphatic return is likewise promoted (see p. 32),

[1] *Op. cit.*, *see* p. 28.

[2] "Über Œdem und Lymphstrom bei der Entzündung," in *Virchow's Archiv.*, vol. lxix., 1877, pp. 516, &c.

[3] In Schäfer's "Textbook of Physiology," vol. ii., 1900, p. 873.

joints are rendered more supple, and stiffness, adhesions, &c., if present, tend to be removed. Any stimulatory effects are practically entirely due to the traction applied.

Between the extremes of the three above classes there are, of course, an infinite number of intermediate grades, and the effects vary accordingly.

II.—*Passive Movements where no Joint is Moved.*—The physiological effects of such manipulations as vibrations, nerve frictions, &c., will be discussed when the individual movements are considered.

CHAPTER V.

GYMNASTIC MOVEMENTS.

I SHALL now proceed to describe the more important gymnastic movements as they are performed by Henrik Kellgren. The arrangement of these in an orderly series is a matter of no little difficulty. The ideal classification would systematise the movements in accordance with their physiological effects; but such an order would, unfortunately, involve too great complexity in other directions, as will readily be perceived; for example, a movement devised to especially benefit the respiratory organs also acts on the circulation; a movement for the circulation also acts on the nervous system; and so on. Neither can the movements be divided into two hard and fast groups of "active" and "passive"; some of them may be administered actively to suit one case, and passively to suit another; passive manipulations may be applied to a patient while the latter is simultaneously performing an active movement; and so on.

I have determined to arrange all the movements under the following heads:—

Flexion and extension (including falling and ringing).
Abduction and adduction.
Rotation (turning).
Pronation and supination.
Inversion and eversion.
Circumduction.
Traction.
(Arm-) carrying.
Drawing.
Expansion.
Lifting.
Vibration and shaking.
Friction.
Hacking, clapping and beating.
Stroking.

Kneading.

Pressing.

Various other movements which do not fall under any of the previous headings.

Special manipulations of various organs and regions.

Terminology.[1]

The terms given above are in themselves occasionally ambiguous, but they have been in use so long that to change them would only cause confusion.

The word "double" (sometimes abbreviated to "2") placed before an arm (or leg) movement, means that the movement involves both arms (or both legs) simultaneously. Whenever it is desired to exercise only one arm or leg, or to perform a movement only to one side with the head or trunk, the word right or left precisely specifies which. When the terms "double," "right" or "left" are omitted the movement is first to be accomplished with one leg, one arm, or to one side with the head or trunk, as the case may be, and then with the other, or on the other side. With certain movements the word "alternate" is used to convey the same meaning.

PA means "patient active," *i.e.*, a purely active movement is to be executed. In the case of a duplicate movement, AR (assistant resisting), or PR (patient resisting), denotes whether it is to be concentric or excentric. PP means "patient passive"—*i.e.*, a passive movement is to be administered. If two such abbreviations be given together, say AR, PR, the first half of the movement is to take place concentrically, the second half excentrically.

In specifying the formula for any movement the following order is maintained:—

(1) The name of the initial position.

(2) The name of the part or parts of the body to be moved, with the prefix "double," "right" or "left," if necessary, inserted before that part (or each part if there be more than one).

(3) The name or description of the actual movement or movements to be executed.

[1] The terms are, slightly modified, those of Branting, who devised a series for the exercises themselves as well as for the positions (*see* p. 16).

(4) Whether the movements be PA, AR, PR or PP, or a combination of two of these.

Whenever both purely active and duplicate forms of an exercise exist, the latter only will be described; the reader will be able without difficulty to deduce the *modus operandi* and effect of the former.

In the following descriptions it is to be understood that, with the exception of the part actually moved, the body is to be kept strictly in the same (initial) position throughout. When discussing the question of what muscles are called into action, it will be unnecessary to consider those which are only used to fix the various joints, above or below (or both) the one actually moved, unless they happen to call for special mention. The effects of a particular movement having been described, and any special mechanism or anatomical point of interest having been pointed out, such details will not be repeated in connection with any other exercises characterised by the same features.

As this work does not aim at being a handbook for beginners, but is an attempt at a scientific interpretation of Kellgren's manual treatment, many points concerning the mere technique, such as variations in the positions assumed by the assistant, different methods of grasping the parts to be moved, &c., will be neglected. Similarly many details as to differences between Kellgren's methods on the one hand, and Wide's on the other, will also be omitted, space being only reserved for a few of the more important ones.

General Directions.

All active movements are to be carried out slowly and evenly, and the minds of both patient and assistant must be concentrated upon them; automatic movements are useless. All exercises, whether active or passive, must be modified to suit each patient, and yet further to suit the daily variations of each patient's health. This is commonly called individualising the exercise.

Whether a purely active or a duplicate movement is to be executed, the patient should stretch himself well, bring his chest out, and let respiration be as free as possible. (See expansion pp. 124, &c.). With every movement involving increase and decrease in the size of the chest, the patient should take a deep

inspiration during the former, and a deep expiration during the latter. After the completion of each exercise a deep respiration must be taken.

Active movements are as a rule executed three times; if performed properly, this number will generally be quite sufficient to produce the maximum effect within the physiological limit. In accordance with Ling's fundamental principle of equilateral harmonious development, all exercises involving only one limb or one side of the head or trunk are repeated in the same manner an equal number of times on the other side, unless contraindicated by the presence of unilateral pathological conditions.

All movements at joints, whether active or passive, are to be executed through the greatest range possible, unless contra-indications (such as acute inflammations, &c.) exist; or, as in a few cases, when the exercise is intended to be accomplished only in part.

As the muscular action in duplicate concentric movements is strongest at the beginning, but weakest at the end (the reverse holding good for duplicate excentric movements), it is often advantageous at the very termination of a concentric exercise to assist the patient's efforts a little; because, although the patient could not, unaided, continue the movement as far as the point to which the assistant's help can bring it, yet he can perform it excentrically from that point—*i.e.*, he can offer resistance at once when the reverse movement is executed.[1]

[1] Side lying leg abduction AR, adduction PR, is a very good example of where this can be done (see p. 94).

FLEXION AND EXTENSION.

I.—Flexion and Extension of the Upper Extremity.

(1) Of the Shoulder-joint.

Mechanism of these movements.—Anatomy text-books as a whole ignore the fact that flexion and extension of the shoulder joint are accompanied by co-movements of the scapula which are similar to those that occur during abduction and adduction of that joint.

Suppose an individual to be sitting or standing with his arm hanging vertically downwards. What ordinarily takes place when he flexes his shoulder-joint is as follows:—The first half of the movement up to the horizontal is accompanied by rotation of the scapula on its own long axis, together with movement of the whole bone *en masse* round the side of the chest; then, after the humerus has passed the horizontal, this rotation becomes less and less, and almost disappears when the final stage of the movement up to the vertical is reached. During the reverse movements of the humerus the reverse obtains (as regards the scapula).

When, however, the individual executes a gymnastic exercise comprising such flexion of the shoulder-joint (during which the shoulders are to be kept drawn inwards and backwards) the sequence of events is different. During the first half of the flexion the scapula practically remains fixed, neither rotating on its own long axis nor moving *en masse* round the wall of the chest. The scapula commences to rotate only when the horizontal has been passed, and this rotation is continued until the final stage of the movement, when it practically disappears. During the reverse movements of the humerus the reverse obtains (as regards the scapula).

The reason for keeping the shoulders drawn backwards and inwards when executing gymnastic movements is that this position enables the chest to be expanded. In consequence of the fixation of the scapula, the coracoid process and humerus are kept as far back as possible, and therefore any contraction of the pectoral muscles only results in approximating the ribs to the

scapula; in other words, the ribs are lifted upwards and a chest expansion results. If the scapulæ were not kept fixed in the above way, then the pectorals, by drawing them forward, would bring about round shoulders.

If instead of stopping at the vertical during the reverse movement, the arm be extended backwards during either of the foregoing exercises, the range of the movement is increased by about another 50°, making the total range 230°.[1]

Another point that seems to have escaped observation is that at the close of the flexion, *i.e.*, when the humerus lies vertical, practically the same muscles must be acting as those which maintain the humerus vertical after abduction through 180°.[2]

Flexion and extension of the shoulder-joint is found in the following exercises:—

Standing Double Arm Raising Forwards and Upwards, PA.

The patient assumes the standing position and then raises his arms, which are to be kept parallel the whole time, from the initial hanging downwards to the reach position (fig. 58, p. 117), where the movement may stop; or it may be continued until the arms are in stretch position (fig. 7, p. 18) and the chest well lifted up, a deep inspiration being taken coincidently. The reverse movement may then be executed, or instead the arms may be adducted, a deep expiration being taken while doing so (see p. 131).

Physiological effect.[3]—The muscles that act as fixators of the joints above and below the shoulder-joint, and also those which perform the movement at the last, have an extra amount of blood sent to them in consequence of their activity.

No movement of the shoulder-joint can be executed without contracting most of the muscles of the shoulder-girdle in order to keep the latter steady, or to move it if it have a relative co-motion of its own. The latter movement may be one either of the scapula, the clavicle, or both. All movements of the humerus likewise have to be executed with fixation or co-movement of the

[1] *Cf.* Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, p. 204.

[2] *Cf.* Neumann, "Das Muskelleben des Menschen in Beziehung auf Heilgymnastik und Turnen," 1855, pp. 124, 125.

[3] The effects of all active and passive exercises are generally more marked in pathological than in normal conditions.

joints below, most of the other muscles of the limb being thus involved, unless it is attempted to eliminate their action by means of fixation or support.

Thus every gymnastic exercise of the arms which entails movement of the shoulder-joint brings about an increased supply of blood to all the muscles of the shoulder-girdle and arm that are involved. Practically all these muscles receive their arterial supply from the subclavian artery and its ramifications (excepting the vertebral), and thus the blood supply to the brain (which goes *viâ* the common carotid and vertebral) will be diminished.

Effect of this movement on the radial pulse, on the volume of blood in the arm, and the heart beat in normal persons. When the arm is hanging vertically downwards, the arteries and veins contain more blood, due to the action of gravity, and the sphygmogram shows a marked dicrotic wave; when the arm is stretched vertically upwards, the arteries contract, the dicrotism markedly diminishes, and an anacrotic wave manifests itself, the latter persisting for at least ten minutes after the completion of the movement. (Urlich,[1] Meuli,[2] v. Kries,[3] v. Frey[4]; *Cf.* Hill Baynard and Sequeira.[5]) The volume of the hand when raised from the vertically hanging down to the stretch position, diminishes 12 cc.; that of the hand, forearm and lower third of the upper arm when doing the same movement is reduced by 30 cc. (Wolff[6]). Elevation of both arms slightly reduces the rate of the cardiac action (Marey[7]).

The next point to consider is the effect of movement of the humerus, scapula, and clavicle on the venous return from the head and arm. Apart from the promotion of the flow by the muscular movement, certain special anatomical mechanisms exist which assist the process (see p. 30).

[1] "Über die Elasticitäts-Verhältuisse der Arterien bei verticaler Elevation," in *Langenbeck's Archiv f. Klin. Chir.*, vol. xxvi., 1881, pp. 1-8.

[2] "Die Veränderuugen von Puls und Temperatur bei elevirten Gliedern," Thesis, 1882.

[3] "Studien zur Pulslehre," 1892, pp. 106, &c.

[4] "Die Untersuchuugen des Pulses und ihre Ergebnisse in gesuuden und kranken Zustanden," 1892, pp. 219, &c.

[5] "The Effect of Veuous Pressure ou the Pulse," in *Journal of Physiology*, 1897, vol. xxi., p. 147, &c.

[6] "Über Schwankungen der Blutfülle der Extremitäten," in *Du Bois Reymond's Arch.*, 1879, p. 161.

[7] "Physiologie médicale de la circulation du saug," 1863, p. 214. *Cf.* also Georgii, "Kinetic Jottings," 1880, pp. 66, 67.

(1) The axillary vein.—Its walls are attached to the axillary fascia, which stretches between the teres major and latissimus dorsi posteriorly, and the pectoralis major anteriorly. Contraction in these muscles causes a stretching of the fascia, which in consequence opens up the vein; subsequent relaxation of these muscles effects the reverse. Thus an alternating suction and force pump is established. (Braune.[1])

(2) The subclavian vein.—"This vein from the pectoralis minor to the scalenus anticus rests in a space of which the walls are quite exceptionally moveable and capable of exerting a very powerful suction on the vein. On exposing the vein by removing a portion of the pectoralis major and the cellular tissue above the clavicle it is easily demonstrated that by means of movements of the arm and clavicle the walls of the vein are drawn apart, and that the venous trunk itself alternately fills and empties." (Braune.[2])

(3) Internal jugular vein.—A similar mechanism to the above exists in regard to movements of the sterno-mastoid, as the walls of the vein are attached to the fascia covering that muscle (Herzog[3]; *cf.* Braune[4]). (The mechanism, however, does not produce its effect if the cervical vertebræ are extended backwards beyond a certain limit. See p. 74.) The sterno-mastoids are called into action in many shoulder movements in which the clavicles participate.

Braune also pointed out that just about the sites of the above-mentioned mechanisms there are many more venous tributaries than in other parts of the vessels.

From the above it is obvious that all active arm exercises, but especially those in which there exists co-movement of the clavicle, are depletive for the head. The same, only to a less extent, holds good for all passive movements at joints in which the same parts are involved. In consequence of this depleting

[1] "Die Oberschenkelvene des Menschen in Anatomischer u. Klinischer Beziehung," 1873, p. 9.

[2] "Die Oberschenkelvene des Menschen in Anatomischer u. Klinischer Beziehung," 1873, p. 9, translated, and p. iii. of "Beitrag zur Kenntniss der Venenclasticität," in "*Beiträge zur Anatomie u. Physiologie*, Festgabe für Carl Ludwig, 1874."

[3] "Beitrage zur Mechanismus der Blutbewegung an der oberen Thoraxapertur," in *Deutsch. Zeitsch. f. Chirurgie*," vol. xvi., 1881, Dec. 20, pp. 1-30.

[4] "Die Oberschenkelvene des Menschen in Anatomischer und Klinischer Beziehung," 1873, p. 9.

effect, the stretch position of the arms, if maintained for half a minute or so, will in most cases partially, and in some cases entirely, stop the flow in an attack of epistaxis.[1]

Effect of this movement on the chest (see pp. 45, &c.).

Every time that a negative pressure is set up in the left subclavian vein, the contents of the thoracic duct are sucked up into it; with the establishment of a positive pressure there is normally no regurgitation owing to the competence of the valves at the orifice of the duct. Thus the flow of lymph in the duct will be furthered by all arm movements, which, like the above, promote the flow in the left subclavian vein.

The following movement is often given in cases of paralysis, &c.:—

Standing Arm Swinging Forwards and Backwards, PA.

The patient assumes the standing position, and then several times swings his arm alternately forwards and backwards as far as it will go. He may, with advantage, stand in front of a ladder and try to swing his arm high enough for his hands to catch hold of successive rungs.

The flexors and extensors of the shoulders are exercised.

Flexion and extension of the shoulder-joint given together with movements at the elbow-joint will be described on p. 53.

(2) Of the Elbow-joint.

There are two divisions:—(*a*) *Flexion and extension of the elbow-joint given simultaneously with movements at the shoulder-joint.* (*b*) *Flexion and extension confined to the elbow-joint.*

It will be best to discuss at once the muscular phenomenon of the movements of flexion and extension of the elbow-joint executed with resistance applied at the wrist-joint or below it, and to point out some facts which, although known to the Ling school at least fifty years ago, seemed to have sunk into oblivion again. Hartelius does not mention them in his works on

[1] *See* Branting's speeches to the graduates of the G. C. I. on April 3, 1843, and April 8, 1848 (the manuscripts of these are preserved in the library of the G.C.I.); the former is quoted by Georgii, "Kinésithérapie," 1847, p. 92. *See also* Georgii, "Kinetic Jottings," 1880, pp. 69, 70, 232. Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, p. 132; "Förkortad Öfversigt af Allmän Rörelselära," 1880, pp. 59, &c.; in Branting's "Efterlemnade Skrifter," 1882, p. xxxii.

anatomy,[1] and Wide does not refer to them in his handbooks; and they are not to be found in modern anatomical text books.

As regards those muscles of the upper arm which aid in these movements, the biceps and brachialis anticus act in flexion, and the triceps and anconeus in extension. This holds good whatever the position of the radio-ulnar joints, although differences in that position produce great differences as regards those muscles of the forearm which are called into action, as follows:—

(1) When the forearm is completely pronated. Flexion is assisted by the extensors on the back of the forearm together with the supinator longus, the tension being felt most in the latter muscle and the extensor carpi radialis longior. The muscles of the upper arm do not work so hard as when the forearm is completely supinated, and the brachialis anticus contracts more powerfully than the biceps, as the latter would by strong contraction supinate the forearm. If the movement of forearm flexion (forearm pronated) be given with AR applied over the ulna or fifth metacarpal, the amount of contraction of the biceps can be felt to be very small indeed, being much less than when the resistance is applied over the radius.[2]

Extension is aided by the flexors on the front of the forearm, the tension being felt most in those on the ulnar side.

(2) When the forearm is in the mid-position. Flexion is assisted by the extensors and flexors on the radial side of the forearm, the tension being felt most in the supinator longus. The extensors and flexors on the ulnar side of the forearm are in action during extension.

(3) When the forearm is completely supinated. The flexors on the front of the forearm, assisted, according to Hj. Ling[3] and Hartelius,[4] by the pronator radii teres, act in flexion and the extensors in extension, as ordinarily described in text books on

[1] "Lärobok i Menniskokroppens Speciella Anatomi," 1867, and "Lärobok i Menniskokroppens Anatomi," 1893.

[2] *See* Eulenburg, "Die Schwedische Heilgymnastik," 1853, p. 86. Neumann, "Das Muskelleben des Menschen in Beziehung auf Heilgymnastik und Turnen," 1855, p. 122 & 123. Branting's remarks on the supinator longus in the MS. of his Lectures on Anatomy (now preserved in the library of the G.C.I.), and his "Efterlemnade Skrifter," 1882, p. 33 and fig. 15. Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, pp. 175, 186.

[3] "De Första Begreppen af Rörelseläran," 1866, p. 187.

[4] "Lärobok i Menniskokroppens Speciella Anatomi," 1867, p. 120; "Lärobok i Menniskokroppens Anatomi," 1893, p. 153.

the subject. The tension is, however, felt most in the muscles of the upper arm, not in those of the forearm, as in the case of pronation or the mid-position.

From the above it is clear that the supinator longus is in action during flexion whatever may be the position of the radio-ulnar joints.

All the foregoing muscular phenomena can be easily demonstrated in the living subject. Photographs fail to show them satisfactorily, except in the case of elbow flexion. In fig. 16 forearm flexion (forearm pronated) with AR is being executed, and the contracting muscles are well shown. Fig. 18 shows the same with the forearm supinated.

Fig. 16.

If it is desired to give elbow flexion and extension with elimination of the flexors and extensors of the wrist and fingers, resistance is applied over the front and back respectively of the forearm close to the elbow. In this case practically only the following muscles are called into action :—Flexion : biceps, brachialis anticus, supinator longus ; extension : triceps and anconeus.

This holds good for whatever the position of the radio-ulnar joints. However, on flexion with the forearm pronated the brachialis anticus works harder than the biceps, if the movement be given with AR over the ulna high up. The reverse is the case if AR be applied over the radius high up.

(*a*) *Movements of the Elbow-joint given simultaneously with Movements at the Shoulder-joint.*

Reach Grasp Stoop Fall Standing Double Elbow Flexion and Extension, PA.

(This may also be called "falling forwards.")

Having assumed reach grasp stoop fall standing position, the patient flexes his elbow-joints, causing them at the same time to pass horizontally outwards and forwards, and keeping his lower

Fig. 17.

limbs, trunk, and head in the same straight line, causes the latter as a whole to describe the sector of a circle whose centre is the ankle-joint. All these movements are executed simultaneously, and the patient reaches swim grasp stoop fall standing position. The reverse movement is then executed (fig. 17).

The muscles placed in action are the extensors of the elbow-joint and some of the shoulder-joint muscles, chiefly the upper

portion of the pectoralis major and the anterior part of the deltoid. These are at first in excentric, then in concentric contraction. In addition, most of the anterior muscles of the trunk and lower limbs are contracted in order to preserve the immobility of their various joints (the ankle being, of course, an exception). The posterior muscles of the trunk are relaxed. The actual movement at the shoulder joint will be described on p. 118.

Standing Double Arm Stretching Upwards, PA.

The patient assumes the standing position and then brings his arms into bend position (see fig. 6, p. 18). He does this by flexing his elbow-joints to their maximum, partially supinating the forearms, and also to some extent flexing the wrist and metacarpo-phalangeal joints. The upper arms are kept vertical, but slightly rotated externally. A pause of a second, or even less, is made, and the humerus being then flexed simultaneously to its maximum, the reverse of the foregoing movements is executed, the arms coming thus to stretch position (fig. 7, p. 18).

This exercise is used in order to bring the patient into stretch position, as is also the movement of standing double arm raising forwards and upwards, PA (p. 46). The flexors of the elbow, wrist and metacarpo-phalangeal joints, and the supinators of the forearm are at first placed in action; then their antagonists, together with the flexors of the shoulder-joint, are used to bring the arms into stretch position.

Standing Double Arm Stretching Outwards, PA.

Is the same as the last, except that in the second stage of the movement there is abduction of the humerus through a right angle instead of flexion. Therefore at the close of the exercise the arms are in yard position (fig. 8, p. 20). The muscles involved are the same as in the case of the last exercise, excepting that the abductors of the humerus are used instead of the flexors.

Half Lying Double Arm Bending and Stretching, AR.

See p. 91.

(b) Movements Confined to the Elbow-joint.

For the execution of these the upper arm must be fixed either by the assistant or by the patient.

(1) The upper arm is fixed by the assistant.

Sitting Forearm Flexion and Extension, AR.

The patient assumes the sitting position with one arm in heave position, and the humerus is fixed by support at the elbow and shoulder. The movements of flexion and extension at the elbow-joint are then executed, with the forearms either

Fig. 18.

pronated, supinated, or in the mid-position. The resistance is applied as in the case of the last exercise (fig. 18).

The muscles that act are the flexors and extensors of the elbow-joint, as described on pp. 49 to 51; the muscles of the shoulder-joint (with the exception of the biceps and triceps) are not brought into play, being eliminated by fixation.

By transferring the grasp of the assistant to near the elbow-joint, the muscles of the forearm (except the supinator longus) can be eliminated (see p. 51.)

(2) The upper arm is fixed by the patient.

Heave Sitting Double Forearm Extension and Flexion, AR.

From the heave sitting position the patient, keeping his upper arms immovable, extends his forearms until yard position is reached, and then the reverse movement executed, both with AR. The point of application of the resistance varies with the position

Fig. 19.

of the radio-ulnar joints ; if the forearms are pronated, it will be first over the palmar and then over the dorsal aspects of the metacarpals ; if supinated, the reverse ; if in the mid-position, first over the inner side of the fifth, and then over the outer side of the second metacarpal (fig. 19).

The humerus is fixed at the shoulder-joint by the abductors and some of the posterior scapular muscles. There is a tendency

in patients unaccustomed to this exercise to bring the pectorals into play if the forearms are supinated (see p. 92).

The muscles of the elbow-joint called into action are first its extensors and then its flexors, as described on pp. 49-51.

(3) Of the Wrist-joint.

Sitting Hand Flexion and Extension, AR.

The patient's forearm is fixed, and the proximal ends of his fingers are grasped by the assistant. While the latter keeps up traction away from the forearm, and resists, the patient alternately flexes and extends his wrist-joint to its fullest extent (fig. 49, page 106).

The flexors and extensors of the wrist are exercised. By transferring the assistant's grasp to the distal end of the metacarpus the movement specially influences the flexors and extensors that are inserted into the wrist-joint and metacarpus, the flexors and extensors of the fingers being less active.

Ulnar or radial flexion of the hand, active or passive, with the forearm fixed, may be administered if it be specially desired to exercise the muscles concerned in these movements. They can also be exercised by means of elbow flexion or extension, with the forearm in the mid-position (p. 50).

(4) Of the Metacarpo-Phalangeal and Inter-Phalangeal joints.

In the case of the former the metacarpals are fixed, and the inter-phalangeal joints being kept fully extended the movements of flexion and extension of the fingers, with or without resistance, are executed. If given with AR the assistant's grasp is over the ends of the fingers, traction being applied away from the metacarpus.

The muscles placed in action are the flexors and extensors of the phalanges, assisted during flexion, in the case of the fingers, by the lumbricals and some of the interossei, which, by means of their insertion into the extensor expansion, enable the patient to keep the inter-phalangeal joints extended.

If duplicate movements of all the inter-phalangeal joints of the fingers are required in addition, the movement of alternately

opening and closing the fist will effect this; resistance can be applied over the terminal phalanges (fig. 20). The action of the lumbricals and interossei is in this case eliminated, the flexors and extensors of the metacarpo-phalangeal and inter-phalangeal joints doing all the work.

If it is desired to isolate and exercise one special inter-phalangeal joint, the bone immediately above it is fixed with one hand, and the one immediately below it grasped with the other; traction of the latter being exercised away from the former, the movements of flexion and extension are then executed.

The flexors and extensors respectively of that particular joint are exercised.

FIG. 20.

II.—Flexion and Extension of the Lower Extremity.

(1) Of the Hip-joint.

There are two divisions :—(*a*) *Flexion and extension confined to the hip-joint.* (*b*) *Flexion and extension of the hip-joint given simultaneously with flexion and extension of the knee-joint.*

(a) Flexion and Extension confined to the Hip-joint.

Lying Leg Flexion, PR, Extension, AR.

The patient assumes the lying position with neck firm.[1] The assistant with one hand grasps the heel of the limb to be

[1] In all leg and foot exercises performed from lying or half lying positions the patient's arms should be placed in neck firm position, unless otherwise stated.

exercised and places the other hand over the iliac crest of that side to steady it. Maintaining traction away from the pelvis, he lifts up the foot so as to cause flexion at the hip-joint, the patient meanwhile resisting and keeping his knee fully extended. When further flexion is impossible without some bending occurring of the latter joint, the reverse movement is executed with AR (fig. 21). The effect of this exercise can be increased by the assistant keeping the ankle strongly flexed the whole time.

Fig. 21.

In the course of the foregoing exercise the patient has to fix the pelvis, first resist flexion, and then perform extension of his thigh. The pelvis is fixed by the erector spinæ, quadratus lumborum, and posterior attachments of the anterior abdominal muscles. The muscles concerned in the actual movement at the hip-joint are its extensors, which are first excentrically and then concentrically contracted. The great sciatic nerve is first elongated and then shortened.

Effect of this exercise on the venous flow. The return of venous blood from the leg is promoted, because in the first place it proceeds in the direction of gravity, and in the second because a special anatomical mechanism to aid it comes into play.[1] In

[1] The effect it produces in this exercise is, however, by no means so marked as in the case of leg rolling (*see* pp. 107, &c.), and some other movements.

its entire course in the thigh, the femoral vein has its walls attached to the adjacent over- and under-lying muscles, fasciæ, &c.; alternate contraction and relaxation of these muscles, or even alternate passive elongation and shortening, will alternately open out and close the vein, setting up first a suction force and then a pumping force. This mechanism is best marked just in the region of the fossa ovalis.[1] (Similar arrangements for furthering the venous flow have already been described in the case of the axillary, subclavian, and internal jugular veins, p. 48).

During the performance of the exercise just described there is depletion of the legs and an increase in the amount of blood in the pelvic organs; after the exercise is over the opposite obtains.

All passive flexions of the thigh diminish the downward pull on Poupart's ligament by withdrawal of the tension exercised upon it by the iliac fascia lata. Thus all such flexions, which entail no effort on the part of the iliacus, psoas, or anterior abdominal muscles, bring about a diminution in the intra-abdominal pressure.

Lying Leg Flexion, AR, Extension, PR.

The movement is the same as for the last exercise, excepting that the patient does the flexion while the assistant resists over the dorsum of the foot just below the ankle-joint; then the assistant brings about the extension with PR (fig. 22).

The pelvis is fixed by the anterior abdominal muscles, and there is a tendency to keep the ribs immovable in order to serve as fixed points for the origin of those muscles, and with this there is a tendency to inhibit contraction of the diaphragm, in consequence of the increased intra-abdominal pressure. This, if unchecked, would lead to an almost entire stoppage of respiration, and must on no account be allowed.

The spinal column is fixed by the erector spinæ in order to counteract the pull on the anterior abdominal muscles, which would, if unopposed, flex the trunk upon itself. The flexors of the hip perform the actual movement at that joint, being first concentrically and then excentrically contracted; the muscles

[1] Braune. "Die Oberschenkelvene des Menschen in Anatomischer und Klinischer Beziehung," 1873.

actually concerned are, according to Hj. Ling,[1] the iliopsoas, rectus femoris, sartorius, pectineus, anterior part of the adductors, tensor fasciæ femoris, and anterior portion of the gluteus medius. In order to give the psoas an increased length, so as to increase its absolute power, the lumbar vertebræ, as the movement proceeds, becomes somewhat convex. This is effected by allowing the contraction of the erector spinæ in the lumbar region to give way a little, and the anterior abdominal muscles to shorten somewhat, both, however, being powerfully in action the whole time. The

Fig. 22.

same movement as this is found in all exercises entailing strong action of the flexors of the hip.[2] The greater the amount of external rotation of the thigh, the harder do the psoas, iliacus, and sartorius work.[3] The quadriceps cruris in its lower part has to act to keep the knee-joint extended, additional strain being thrown on it, the further the movement of flexion proceeds, from increasing tension in the hamstrings. During the reverse movement the normal curve in the lumbar vertebræ is restored by the lumbar portion of the erector spinæ shortening again, and the

[1] "De Första Begreppen af Rörelseläran," 1866, p. 187.
[2] *See* Hj. Ling, *op. cit.*, p. 205.
[3] *See* Hj. Ling, *op. cit.*, p. 187.

extra strain on the lower part of the quadriceps cruris is gradually removed.

The flexors of the ankle-joint can be eliminated if the resistance be applied above the ankle instead of below it.

All movements entailing strong action of the anterior abdominal muscles in all probability act reflexly in a stimulatory way on the abdominal contents.

Lying Double Leg Flexion and Extension, PA.,

is the same as the last, only without resistance, and is executed with both legs simultaneously. This movement can also be given in a strong subject as flexion, AR, extension, PR, in which case the patient's elbows have to be fixed by a second assistant.

The effects are as from the last exercise, only much more marked; greater convexity results in the lumbar vertebræ, and the anterior abdominal muscles are placed very strongly in action. The effects will, in fact, be specially manifested on the abdominal contents.

Side Lying Leg Carrying Forwards and Backwards, AR.

The patient assumes the side lying position; the assistant, steadying the pelvis with one hand, with the other grasps the ankle-joint of the leg which lies uppermost. The patient, continually keeping that leg horizontal and the knee-joint fully extended, flexes the hip-joint as far as it will go with AR, and then resists while the reverse movement is executed; after a pause of a second or so, he extends his hip-joint with AR, and then resists while the reverse takes place, keeping his knee-joint fully extended as before. The effects are similar to those of the exercises described on pp. 57-61.

The following movement may be given in cases of paralysis, hip-joint disease, &c :—

Standing Leg Swinging Forwards and Backwards, PA.

The patient assumes the standing position, and then lifts up the pelvis of one side (say the right) a little, so that the right heel does not touch the ground. Then he swings the right leg alternately forwards and backwards several times. As the leg

hangs by its own weight it exerts a certain amount of traction, and so will diminish pain from stiffness, &c., in the hip-joint.

The flexors and extensors of the hip-joint are exercised.

Forwards Lying Leg Flexion, PP, Raising, AR.

The patient lies in the forwards lying position. The assistant uses one hand to grasp the ankle of the leg that is to be exercised, steadying the pelvis of that side with his other hand. Then with traction away from the trunk, he brings that leg

Fig. 23.

(with the knee quite extended) down over the side of the couch, flexing it until an angle of 60° or so with the horizontal is reached. The patient thereupon executes the reverse movement with AR over the back of the ankle, traction being maintained as before.

The effect of the exercise is increased if the patient, instead of ceasing to raise his leg when it has reached the horizontal position, continues to extend it as much as possible above the couch, and then resists while the assistant presses it down to the original position again.

The movement is one of flexion and extension of the hip-joint together with a certain amount of abduction and adduction, which are necessary in order to enable the limb to be brought over the side of the couch and back again.

The muscles involved are those which bring about extension and adduction of the thigh. The gluteus maximus is specially affected, being first elongated, and then by its concentric contraction performing both extension and adduction of the hip-joint.

This exercise is a very good one for disorders of coördination. This is because the patient cannot look at the part actually moved, and has thus to depend on his sensory functions alone for correct performance. The same advantage pertains to other exercises in which the use of sight is physiologically eliminated.

(*b*) *Flexion and Extension of the Hip-joint given simultaneously with Flexion and Extension of the Knee-joint.*

Half Lying Leg Flexion, PP, Extension, AR.

(This exercise may also be given with both legs at once.)

The patient assumes the half lying position. The assistant, grasping the patient's heel with one hand, lays the other to the outer side of and below the knee-joint. Then, keeping up external rotation of the thigh, he flexes and abducts the hip and flexes the knee as far as these joints will allow him, continually keeping the heel along the middle line. The patient then executes the reverse movement with AR applied under the heel, the assistant's other hand being kept at the knee-joint to steady it (fig. 24).

The extensors and adductors of the thigh, and extensors of the knee are first passively extended,[1] and then concentrically contracted. The internal rotators of the thigh are also similarly affected, though to a much less extent. If the first part of the movement be given with flexion, PA, or AR (instead of PP), the flexors, abductors, and external rotators of the thigh and

[1] According to Hj. Ling, these as well as the muscles of the calf are specially susceptible to passive elongation. *See* "De Första Begreppen af Rörelseläran," 1866, pp. 218-219.

flexors of the knee contract actively instead of being passively shortened.

If the thigh be first rotated internally (so that the toes point upwards instead of outwards) it is possible, by keeping the knee-joint and heel along the middle line (thus eliminating rotations, abduction, and adduction of the femur), to convert the movement into one of pure flexion and extension of the hip- and knee-joints.

Effect of this exercise on the venous flow.—The venous flow is specially promoted by:—

Fig. 24.

(1) The existence of the special mechanism in the case of the femoral vein, by means of which movements of the muscles to which the outer wall of the vessel is attached alternately set up a suction and force pump in it. This has been referred to on p. 59.

(2) A similar mechanism obtains through the attachment of the walls of the femoral vein, just at its commencement, to the foramen in the adductor magnus.[1]

[1] Braune, "Die Oberschenkelvene des Menschen in Anatomischer und Klinischer Beziehung," 1873.

(3) The walls of the popliteal vein are in a like manner attached to the popliteal fascia, which is alternately stretched and relaxed in certain movements of the knee-joint, unless hyperflexion is performed, in which case the vein is forcibly compressed.[1]

Half Lying Leg Flexion, PA, Extension, PR.

(This exercise may also be executed with both legs at once).

The patient first draws his leg up into the same position as the assistant placed it in the first half of the last exercise. The assistant then places one hand on the patient's shoulder to steady him, and the other hand just above the knee; then, with resistance from the patient, he presses the knee down, thus causing extension of the thigh. Meanwhile, the patient must extend his knee-joint so as to keep his foot off the couch until the very moment of completion of the movement, when the whole limb returns to the original position.

The flexors, abductors, and external rotators of the thigh are first concentrically and then excentrically contracted; the extensors of the knees are also somewhat contracted, first excentrically and then concentrically. The anterior abdominal muscles are powerfully contracted in order to fix the pelvis, and the erector muscles of the back have to act in order to fix the ribs. (For their special action see pp. 59, 60.)

As with the last exercise, rotations, abduction and adduction of the hip-joint may be eliminated.

Stretch Grasp Standing Knee Flexion (Raising), AR, Pressing down, PR.

The patient assumes the stretch grasp standing position, and, keeping up external rotation of the hip, flexes and abducts his thigh as much as possible, letting his knee-joint be flexed meanwhile so that the lower leg hangs vertical throughout. This is effected with AR just above the knee-joint. The reverse movement is then executed with PR.

The pelvis is fixed by the anterior abdominal muscles. The actual movement is achieved by the flexors of the hip-joint, which are first concentrically and then excentrically contracted. The

[1] Braune, "Die Oberschenkelvene des Menschen in Anatomischer und Klinischer Beziehung," 1873 (p. 3).

abductors of the thigh are also involved. As the assistant's grasp is above the knee, practically all the muscles of the lower leg are thrown out of action. The changes in the lumbar vertebræ are the same as those specified on p. 60.

As with the last two exercises, rotations, abduction and adduction of the hip-joint may be eliminated.

(2) Of the Knee-joint.

There are two divisions :—(*a*) *Flexion and extension of the knee-joint given simultaneously with other movements at the hip-joint.* (*b*) *Flexion and extension confined to the knee-joint.*

(*a*) *Flexion and Extension of the Knee-joint given simultaneously with other Movements at the Hip-joint.*

Standing Double Knee Bending, PA.

From the initial position the patient, by bending his knees and keeping them well outwards, taking care that his heels do not leave the ground, comes to knee bend standing position. The reverse movement is then executed.

The extensors of the knees, extensors, adductors, and rotators of the hip, and extensors of the ankle (excepting the upper part of the gastrocnemius) are placed in action. This movement is administered chiefly in order to stretch the posterior calf muscles.

Toe Standing Double Knee Bending, PA.

The patient first rises on his toes until toe standing position is reached (see p. 71) ; then, by bending his knees and keeping them well outwards, he comes into knee bend toe standing position. These movements are then executed in the reverse way in the reverse order (fig. 9, p. 20).

Varying positions of the arms may be used, such as stretch lean, reach lean, &c.

The muscles placed in action are the same as in the case of the last exercise, with the addition of the plantar muscles, which serve to maintain the arches of the foot.

The above movement, executed slowly from the standing position (with the correct specific rate of execution) causes the pulse to become slower a few seconds after its completion. The

same effect has been observed after many other leg exercises (Petersen,[1] Hartelius[2]).

Reach Grasp Step Standing Knee Flexion and Extension, PA.

This exercise is a combination of reach grasp step standing double elbow flexion and extension, knee and thigh flexion and extension, PA. Suppose the left leg to be placed in step position. While doing double elbow flexion and falling forwards, as described on pp. 52, &c., the patient simultaneously flexes his left knee and thigh, keeping up external rotation of the hip-joint and abducting it as well. When the body has reached swim grasp stoop fall standing position, the reverse movement i executed; but instead of being terminated at step position, it is to be continued until the left knee is fully extended, to allow of which some flexion of the right thigh and extension of the right ankle takes place. The right knee, however, must constantly be kept fully extended (fig. 80).

The effects of this exercise, apart from those produced by the falling forwards and the arm movements, are as follows :—At first the flexors of the left knee, flexors and abductors and external rotators of the left thigh, are placed in action, although only to a moderate degree, as the movement of the leg is to a great extent an involuntary accompaniment of falling forwards. During the second part of the movement the antagonists of the above muscles are placed in action, especially the extensors of the hip-joint. The further the movement proceeds, the more a sense of tension is felt in the whole of the posterior muscles of the left leg, and this becomes very marked towards the close of the movement. The higher the foot was placed to begin with, the more will this tension manifest itself.

Many of the muscles of the right leg are brought into play in order to maintain equilibrium and to keep the knee extended.

Reach Grasp Step Standing Trunk Raising, PA.

The patient assumes reach grasp step standing position and then flexes the knee that is in step position, say the left one,

[1] "Iagttagelser over en langsom Benbevaegelses Indflydelse på Pulsens Hastighed," in *Tidskrift i Gymnastik*, 1880, pp 795, &c.; and "Iagttagelser over Benbevaegelsers Indflydelse på Pulsens Hastighed," *ibid.*, 1881, p. 926, &c.

[2] "Den Mekaniska Agentens Förhållande till Hjertsjukdomar," *ibid.*, 1886, p. 402, &c.

until it comes to rest against the apparatus, so that the lower leg lies vertically. Keeping his head and trunk well erect and his right leg vertical, he slowly extends both knee and thigh of the left side, thus raising himself slowly off the ground, using his arms as a help, meanwhile extending his shoulders and flexing his elbows in order to preserve the erect position of the trunk. The movement is continued until both knee and thigh are fully extended, so that the patient ultimately stands up against the ladder, supported by his left foot and his arms. The arms, however, should be used as little as possible to aid the raising process, in order to throw the maximum amount of work onto the left leg. The reverse movement is then executed.

The extensors of the knee and thigh of the limb in step position are placed strongly in action. Some of the muscles of the arms are also involved, especially the extensors of the shoulders, and flexors of the elbow-joints and fingers.

(*b*) *Flexion and Extension confined to the Knee-joint.*

Sit Lying Knee Extension and Flexion, PP.

The sit lying position is assumed with neck firm ; the assistant grasps the patient's foot across the instep with one hand, and places his other hand anteriorly just above the anterior surface of the knee-joint in order to fix the thigh. Keeping up traction away from the latter, he several times alternately performs extension of the lower leg up to the horizontal, and then flexion down to the vertical (fig. 25).

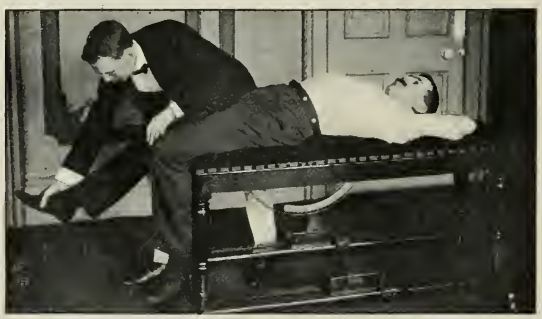

Fig. 25.

The effects will be similar to those resulting from energetically given passive movements (see p. 38), the areas affected being the flexor and extensor group of muscles of the knee-joint. The special mechanism that aids the flow in the popliteal vein has already been referred to (p. 65).

Sit Lying Knee Extension, AR, Flexion, PR.

The position of the patient and the grasp of the assistant are the same as in the foregoing exercise. The assistant, keeping up traction away from the thigh, resists while the patient extends his lower leg up to the horizontal. Then the reverse movement is executed with PR.

The extensors of the knee and flexors of the ankle are exercised. The latter group of muscles would be eliminated if the assistant transferred his grasp to above the ankle-joint.

Forwards Lying Knee Flexion, AR, Extension, PR.

The patient assumes the forwards lying position; the assistant uses one hand to fix the thigh just above the knee-joint posteriorly, and with the other hand grasps the heel. While the assistant performs traction away from the knee, and offers resistance, the patient flexes his lower leg from the horizontal to the vertical, or as far as it will go; the reverse movement is then executed with PR.

(3) Of the Ankle-joint.

Half Lying Foot Flexion and Extension, AR.

The assistant sits at the side of the foot to be exercised, so as to look transversely across it, as in fig. 26. The lower leg of the patient, just above the ankle-joint, rests upon the knee of the assistant, who uses one hand to complete the fixation of the lower leg by grasping it on its corresponding anterior aspect, exercising traction away from the trunk in the case of disease of the hip or knee-joint of the limb. The assistant's other hand is applied to the foot, so that the palm rests against the plantar

aspect of the distal ends of the metatarsus; and the fingers enclosing the foot rest against the corresponding dorsal aspect.

Then with AR applied over the dorsum, the patient flexes his foot as far as possible, after which, with AR under the sole, he extends it to the maximum (fig. 26). (See also chap. vi.)

At first the flexors of the ankle and extensors of the toes are in action, and then their antagonists, the latter including many of the plantar muscles, which serve to maintain the longitudinal arch of the foot. The intertarsal joints participate in the movement.

Fig. 26.

Half Lying Double Foot Flexion and Extension, AR.,

is the same movement as the last but performed with both feet at once.

The assistant sits at the feet of the patient so as to face him and supports the latter's lower legs just above the ankle-joints, as in fig. 27. He grasps each foot with one hand but not in the same manner as in the last exercise. Each hand is placed so that the thumb, instead of the palm, lies on the plantar aspect of the distal end of the metatarsus; the palm rests against the external aspect of the fifth metatarsal bone, and the fingers lie over the dorsal aspect of the metatarsals.

The same movement as in the case of the last exercise is then executed, but with both feet simultaneously instead of one at a time. The same muscles are called into action, with this addition, that when the movement is performed with both feet

the lower legs of the patient are not fixed so completely; thus the patient has to keep his knees straight. There is a great tendency for flexion to occur in the knees during the last stage of the foot flexion, owing to increasing tension in the gastrocnemius, and the quadriceps cruris has to work hard to counter-balance this.

Standing Double Heel Raising, PA.

This has virtually been described under toe standing double knee bending (p. 66); it is, however, sometimes prescribed by

Fig. 27.

itself. The patient rises slowly on his toes as high as possible to toe standing position, and then executes the reverse movement. The effect of the exercise may be doubled by keeping one foot passive, using only the other to do the raising. In either case the arms may be placed in reach lean or reach grasp position, for the sake of balance.

The extensors of the ankles, including the gastrocnemius (see p. 66) and many of the plantar muscles (which serve to maintain the arches of the foot) are exercised.[1]

Standing Alternate Foot Flexion and Extension, PA.

From the standing position the patient, keeping his heel on the ground, first flexes the ankle-joint as far as it will go, and then extends it until the sole of the foot again rests on the

[1] *Cf.* Hj. Ling "De Första Begreppen af Rörelseläran," 1866, pp. 184, 199, 206.

ground; he then does the same with the other foot. The process should be repeated several times.

The flexors of the ankles and extensors of the toes are at first in concentric, then in excentric contraction. The higher the flexion proceeds, the harder the extensors of the knees have to work in order to counteract the increasing tension in the gastrocnemius, just as in the case of half lying double foot flexion, AR (see p. 71).

A variety of foot flexion is as follows:—The thigh lies horizontally and is fixed; the lower leg hangs by its own weight (the knee-joint being thus flexed to a right angle); the leg is at such a height that in this position the toes do not touch the ground. If the movements of foot extension and flexion be then executed, it will be seen that during the first there is no contraction in the gastrocnemius, soleus or plantaris. According to Hj. Ling the movement is accomplished only by the tibialis posticus and peronei, and in this particular case the foot is no longer a lever of the first order as it is in all other exercises.[1]

(4) Of the Other Joints of the Foot and Toes.

Flexion or extension may be given, if so desired, at any of the above joints that permit of these movements. The bone immediately above the articulation it is desired to affect is fixed by one of the assistant's hands, the other hand being employed to apply traction, and also, in the case of duplicate movements, the necessary resistance, at the bone immediately below.

The flexors and extensors respectively of the joint manipulated are exercised.

III.—Flexion and Extension of the Head.

(1) Flexion Forwards and Extension Backwards.

Reach Grasp Standing Head Flexion, PR, Extension, AR.
(Also called neck bending and stretching.)

This exercise can be administered in one of two ways, the more common being as follows:—(*a*) The patient assumes the reach grasp standing position; the assistant places both hands

[1] "De Första Begreppen af Rörelseläran," 1866, p. 184.

on the patient's head so that his thumbs lie under the superior curved lines of the occipital bone, and the fingers, somewhat spread out, rest against the lateral parts of the skull. Then, continually lifting the head upwards, the assistant flexes it forward with resistance from the patient, who at the same time keeps his cervical vertebræ immovable and draws in his chin. By performing the exercise in this manner, the actual movement that takes place is confined to the occipito-atlantal joint. The reverse movement is then executed with AR (fig. 28).

The circulation through the brain is hastened, this being due to the alternate elongation and shortening of the vertebral vessels, carotid arteries and internal jugular veins. The flow in the

Fig. 28.

latter is especially furthered because of the attachment of their walls to the sterno-mastoids, alternate shortening and elongation of which alternately decrease and increase the lumen of the vessels (see p. 48). The muscles placed in action are the extensors both of the cervical vertebræ and of the occipital bone, some of them being maintained in a constant attitude in order to fix the cervical vertebræ, while others are first excentrically and then concentrically contracted in order to execute the movements at the occipito-atlantal joint. In consequence of their activity, they become more fully supplied with blood, and thus act depletingly on the brain.

(*b*) If abnormal curvatures forwards in the cervical vertebræ, such as are found in cases of paralysis agitans, &c., have to be

dealt with, the movement is performed in rather a different manner from that just described; the cervical vertebræ, instead of being kept rigid, are allowed to participate in the movement.

When the exercise is achieved in the second manner, the vessels are not subjected to such an amount of alternate elongation and shortening as when the cervical vertebræ are kept immovable. The weakened posterior muscles, ligaments, fasciæ, &c., of the cervical part of the spinal column are specially affected.

If the movement be carried out in the opposite direction, *i.e.*, first extension backwards with AR, and then the reverse with

Fig. 29.

PR, the chin not being drawn in, a tendency towards congestion of the head results. This is because:—

(1) The hyoid bone is elevated; thus there is a reversal of the function of the omo-hyoid muscle, which normally acts continuously in keeping the walls of the internal jugular vein open, but which will now exert continuous pressure on the vein, and cause diminution in its lumen and in the volume of its blood flow.

(2) The sterno-mastoid is stretched, which under ordinary circumstances would open out the internal jugular vein; but as the cervical vertebræ are extended on themselves, the vein will

be caught between them and the sterno-mastoid, and suffer continuous pressure.

Head flexion, PR, extension, AR, may also be administered from other initial positions, such as hips firm arch forwards lying. The assistant's grasp is different from the one used when the movement is given from reach grasp standing position; and will be most easily understood from the illustration (fig. 29). In this case the muscles called into action are the erectors of the spine, which have to keep the patient in arch position, and the cervical extensors (as mentioned on p. 73).

Fig. 30.

(2) Other Varieties of Head Flexion and Extension.

(1) Head flexion laterally, AR (and the reverse movement, PR), is used to exercise the sterno-mastoid, complexus, trapezius, &c., of one side (fig. 30).

(2) A combined movement of extension, lateral flexion, and rotation may be employed in order to exercise one sterno-mastoid. Suppose it necessary to deal with a case where there is contraction in that muscle of the left side. The appropriate treatment will be to exercise its weakened antagonist by so placing the head that it has a chance of contracting; and in the course of time, if it be exercised sufficiently, it will by its physiological pull correct the deformity by removing the contraction and restoring equilibrium between the two muscles. In order to effect this

the head is flexed more to the left, extended still further backwards, and rotated yet more to the right, with PR; the reverse is then executed with AR. Thus the weakened sterno-mastoid is exercised at the expense of the contracted one [1] (fig. 31).

To try and forcibly stretch the contracted muscle without exercising its antagonist will do no good, as this results in simply stimulating the former, and thus tending to increase the deformity.

Fig. 31.

IV.—Flexion and Extension of the Trunk.

There are four kinds:—(1) Flexion and extension of the trunk on the hip-joints (the vertebral column remaining immovable). (2) Flexion and extension of the trunk on itself (*i.e.*, the movement is confined to the vertebral column, the hip-joints not participating). (3) A combination of the above two. (4) Lateral flexion and extension of the trunk on itself (*i.e.*, the movement is confined to the vertebral column, the hip-joints not participating).

Examples of the above trunk movements occur in many exercises, and the terms flexion and extension (or bending and stretching) have been applied to some of them. They will now

[1] The principle already advocated by P. H. Ling, on which rests the administration of the above movements, is the fundamental one for the treatment of all deformities. (*Cf.* "Gymnastikens Allmänna Grunder" (1834), 1840, p. 189.)

be fully described. There are, however, many others, called by other names, such as drawing backwards, &c.; these will be dealt with later under their respective headings.

(1) Flexion and Extension of the Trunk on the Hip-joints.

Ride Sitting Trunk Flexion, PR, Extension, AR.

The patient assumes the ride sitting position with hips firm and back as straight as possible. The assistant places one hand under the patient's occiput, as in the figure, and the

FIG. 32.

other hand on the patient's thigh, in order to steady him. Keeping up traction away from the hips, the hand under the occiput presses the latter forwards and downwards, the patient continually resisting and keeping his head erect and his spinal column quite straight. Thus flexion of the trunk on the hip-joints takes place, and this is continued through an angle of about 75°, whereupon the reverse movement is executed, with AR (fig. 32). This movement may also be performed from leg lean stride standing position (with hips firm).

The extensors of the thighs are first excentrically and then concentrically contracted; the spinal extensors from sacrum to occiput are also placed vigorously in action, and undergo greater stress as flexion proceeds; during extension the extra strain on them is gradually removed. In consequence of this and of the fact that the patient has to keep his back as straight as possible, the exercise tends to correct any abnormal curvatures and rotations that may exist in the spinal column. It may here be added that *all* movements in which the patient has *actively* to try and straighten his spine tend to correct such deformities, as they entail the patient making efforts to contract the weakened muscles at the expense of the too strong antagonists (*cf.* pp. 75, 76).

Effect on the abdomen.—The abdomen is subjected at first to an increase of pressure, and then to a corresponding decrease. The precise effect of this will be considered on p. 83.

Falling.

By falling is meant, unless otherwise specified, a falling forwards, during which the lower limbs and trunk move as a whole. This has been described already (p. 52).

Falling backwards occurs in the following:

Ride Fall Sitting Breathing, PA.

The patient assumes the ride sitting position, usually with hips firm (see p. 79), and then lets his trunk fall backwards by means of extension at the hip-joints, until ride fall sitting position is reached. He remains in this position long enough to respire deeply three times, and then raises the trunk to the original position again (fig. 33).

The flexors of the hip-joint perform the movement, which entails a powerful stress on the spinal and abdominal muscles, and is of special benefit to the latter. Powerful action of the anterior abdominal muscles in all probability reflexly stimulates the abdominal contents (see p. 61). (Further particulars as to the active muscles can be found on p. 59.) The respiratory organs are also benefited. During the progress of this exercise, proper respiration is of the strongest importance, otherwise great engorgement of the veins arises in a very few seconds.[1]

[1] *Cf.* Hj. Ling in Branting's "Efterlemnade Skrifter," 1882, pp. xxi., xxiii.

Sitting Trunk Extension and Flexion, PA.

(Also called sit lying back raising).

From the sitting position with hips firm (see below) and the lower legs fixed, the patient, keeping his head erect and his spine as straight as possible, slowly falls backwards, *i.e.*, he allows extension of the trunk on the hip-joints to take place, until sit lying position is reached. The reverse movement is then executed.

The flexors of the hip-joints are first in excentric, then in concentric contraction, and the anterior abdominal and erector spinæ

Fig. 33.

muscles have to work hard in order to keep the trunk straight. The effect of the exercise is very similar to that of lying double leg flexion and extension, PA (p. 61). It can be increased by keeping the patient's arms in neck firm position; or, what entails even greater effort, in stretch position. Other exercises such as ride fall sitting breathing, PA (see p. 78), can also be graduated in a similar manner.

The exercise can also be rendered more difficult of execution

by only fixing the upper legs, as thereby the lower part of the quadriceps cruris is thrown out of action.

(2) Flexion and Extension of the Trunk on Itself.

Forwards Lying Back Raising (Arching) Breathing, PA.

The patient assumes the forwards lying position. The assistant fixes the patient's feet and exercises traction on them away from the trunk. Placing his arm into hips firm position, the patient then brings himself into arch forwards lying position, and remaining thus, breathes deeply three times (fig. 34). The

Fig. 34.

effect of this exercise may be increased by putting the arms into neck firm, or even in stretch position (see p. 79).

The extensors of the spinal column and thighs are in action. This movement is also a respiratory exercise.

Head Lean Arch Standing Toe Raising, Breathing, PA.

The patient assumes the head lean arch standing position with hips firm. He then rises on his toes, but keeps his head at

the same level as at first, after which he sinks down on his heels, on this occasion letting body and head move together; the net result is to leave the spinal column more arched than before. The process is repeated three times; each time the patient's head descends, and each time his spinal column becomes more and more arched in the dorsal region, while his chest is brought out more prominently (fig. 35). Deep inspiration should take place during the rising on the toes, deep expiration during the

FIG. 35.

reverse. After the third repetition the patient straightens himself up to hips firm standing position.

When patients are unable to perform this exercise without the spine becoming lordosed during its execution, the position of the head may be left constant instead of being allowed to change with each sinking on the heels.

The muscles affected are brought into use in the following manner:—During the first part of the exercise, in order to bring the patient into arch position, there takes place:—a slight concentric contraction of the erector spinæ muscles with elongation

of the anterior abdominal muscles. This is almost immediately replaced by an excentric contraction of the anterior abdominal muscles, to counteract the pull of gravity, with passive shortening of the erector spinæ. Elongation of the anterior abdominal muscles in consequence of recommencing concentric contraction of the erector spinæ then takes place. During the second part of the movement (*i.e.*, during the toe raising), the erector muscles of the spine and extensors of the ankle-joint are in action. The return to the original position is effected through concentric contraction of the anterior abdominal muscles (*cf.* Hj. Ling[1]).

This movement is very useful in disorders of coördination, (see p. 63); it is also a chest expanding exercise (see p. 124.

(3) Flexion and Extension of the Trunk on the Hip-joints, combined with Flexion and Extension of the Trunk on Itself.

Stretch Stride Standing Bending Forwards, PA.

The patient assumes the stretch stride standing position, (fig. 7, p. 18), stretched to his utmost with the abdomen well drawn in (this latter is very important in the case of a patient suffering from pelvic disease or hernia through the anterior abdominal wall). He then proceeds as follows :—

(1) He flexes his trunk on his hips as in ride sitting trunk flexion (p. 77). In order to preserve the balance the pelvis must meanwhile be carried somewhat backwards. (2) Having executed this movement as far as possible without bending the knees, he flexes the spinal column on itself, the flexion commencing in the upper dorsal region and gradually passing downwards. The arms, however, are throughout to be kept as far back as possible. (3) When this has been carried out to the utmost limit, he executes the reverse of (2), still keeping the knees quite straight. (4) Finally he executes the reverse of (1), so as once more to reach the initial position.

This division into parts is merely for the sake of clearness of description; in practice the exercise should be performed evenly

[1] "De Första Begreppen af Rörelseläran," 1866, pp. 216, 217.

and continuously, the parts merging into one another without a break.

The actual movement is initiated by a concentric contraction of the anterior abdominal muscles and flexors of the hip-joint, with elongation of the extensors of the hip-joint. This is almost immediately replaced by excentric contraction of the latter, to counteract the pull of gravity. When that stage of the movement is reached where the spinal column is flexed on itself, there takes place excentric contraction of the erector spinæ, aided at the very termination of this stage by recommencing concentric contraction of the anterior abdominal muscles and flexors of the hip-joint. The reverse movement is then effected by concentric contraction in the erector spinæ and extensors of the hip-joint.

The flexors of the ankles are first excentrically and then concentrically contracted. The extensors of the knees have to work hard in order to maintain the straightness of the knees against the pull of the hamstrings. Many of the other muscles of the leg are active in order to maintain equilibrium.

Effect on the abdominal contents.—In consequence of the alternate application and removal of pressure and of the alternate elongation and shortening of many of the abdominal blood and lymph vessels, the whole of the abdominal contents are stimulated, and the venous and lymphatic return from them promoted. For the same reasons the flow in the thoracic duct and inferior vena cava will be hastened, as these structures lie against the vertebral column and closely follow all its movements. Thus the venous return from the legs will be influenced as well as that from the splanchnic area (*cf.* P. H. Ling,[1] Georgii,[2] Hj. Ling,[3] Lovén,[4] Braune [5]).

Effect on the thorax.—The blood-vessels and lymphatics of the intercostal spaces will be alternately subjected to and relieved from pressure, and thus their venous and lymphatic circulation will be promoted. The latter is aided by the fact that the lymphatics of these spaces are arranged in two sets just as in all the

[1] "Gymnastikens Allmänna Grunder" (1834), 1840, p. 143.

[2] "Kinetic Jottings," 1880, pp. 112, 113.

[3] "Förkortad Öfversigt af Allmän Rörelselära," 1880, p. 54.

[4] "Om Blodet," 1876, pp. 59, 60.

[5] "Beitrag zur Kenntniss der Vencnelasticität," pp. ii. and v., in "Beitrage zur Anatomie und Physiologie, Festgabe für C. Ludwig," 1874.

tendons and aponeuroses of the body [1] (see p. 27). The lungs are alternately diminished and increased in volume.

Effect on the spinal cord and size of the spinal canal.—First elongation and then shortening of the spinal cord [2] and its longitudinal veins take place; the spinal cord will be stimulated, and the flow in the veins hastened. The capacity of the spinal canal is probably first slightly diminished and then increased.[3]

(4) Lateral Flexion and Extension of the Trunk on Itself.

Stretch Stride Standing Bending Sideways, PA.

The patient assumes the stretch stride standing position, stretched to his utmost. He then flexes his trunk laterally to side bend position, stretching especially the arm of the elongated side, keeping his lower limbs and pelvis as still as possible. No rotation of the vertebræ should take place, *i.e.*, there should be no protrusion of either shoulder or hip. The reverse movement is then executed, thus bringing the patient back into the initial position, after which the whole process is repeated towards the other side (fig. 36).

Respecting the muscles that are in action in this movement:—Suppose the patient to perform the exercise towards the left side. At first the left lateral flexors of the trunk contract concentrically to a very small amount; immediately after this they undergo a passive shortening, this being due to excentric contraction of the right lateral flexors, to counteract the pull of gravity. When the latter are incapable of further excentric contraction they become elongated, in consequence of recom-

[1] Dybkowski, "Über Aufsaugung und Absonderung der Pleurawand," in *Arbeiten an der Phys. Anat. zu Leipzig*, 1866, pp. 40-67.

[2] *See* Hegar, "Die Rückenmarksdehnung," in *Sammlung Klinischer Vorträge*, 1884, No. 239; *Gynäkologie*, No. 65, pp. 1699-1714. Tourette and Chipault, "Le traitement de l'ataxie par l'élongation vraie de la moelle épinière," in *Nouvelle Iconographie de la Salpêtière*, 1897, vol. x., pp. 145-154. Tourette and Gasne, "Le traitement de l'ataxie locomotrice par l'élongation vraie de la moelle épinière," *ibid.*, 1898, vol. xi., pp. 18, 19. P. H. Ling refers to exercises on the spinal cord in "Gymnastikens Allmänna Grunder" (1834), 1840, p. 158. *Cf.* Neumann, "Lehrbuch der Leibesübungen des Menschen," 1856, part ii., pp. 136, &c. Hj. Ling, "Förkortad Öfversigt af Allmän Rörelselära," 1880, p. 54.

[3] Reid and Sherrington, "The Effect of Movements of the Human Body on the size of the Spinal Canal," *Brain*, vol. xiii., 1890, pp. 449-455.

mencing concentric contraction of the left lateral flexors, which continue to contract until the right side of the trunk cannot be elongated any more. The right lateral flexors then perform the reverse movement.

The effect on the abdomen is the same as in the case of the last exercise. The circulation in the inferior vena cava and the lower two azygos veins is hastened, as is also the venous and lymph flow from the intercostal spaces and the pleura. There

Fig. 36.

will be alternately an increase in the size of one lung, coupled with a decrease in the size of the other, and then the reverse.

Effect on the spinal cord.—All lateral trunk movements produce elongation of one side of the cord and shortening of the other, though whether this is sufficient to cause an appreciable stimulation has as yet not been experimentally demonstrated.

Hip Lean Walk Standing Lateral Flexion, PP, Extension, AR.

The patient assumes the hip lean walk standing position with neck firm. The assistant grasps the patient round the elbows, and, while keeping up traction away from the pelvis, flexes his trunk laterally over the bar into side bend position. The reverse movement is then executed with AR applied at the

Fig. 37.

elbow of the extended side, the assistant's other hand being only used to steady the patient (fig. 37).

The muscles placed in action are the lateral flexors of the trunk on the side remote from the support, which are first passively elongated and then concentrically contracted. The effect of this movement on the abdomen and thorax is the same as in the case of the last exercise.

Ringing.[1]

This is a passive form of movement, consisting in a rapid alternating flexion and extension. The use of the word, however, is very restricted.

Loin Lean Stride Standing Ringing, PP.

The patient assumes the loin lean stride standing position, with the arms in neck firm position. The assistant applies his

Fig. 38.

grasp under the patient's elbows, and keeping up traction away from the pelvis, flexes the patient's trunk to one side (say the left) into left side bend position, then right over through the

[1] This is a literal translation of the Swedish word "ringning," and though not bearing quite the same meaning, is yet the nearest English equivalent possible.

original to right side bend position, and back again. Altogether the process is repeated six or eight times fairly quickly, the patient returning at the close into the initial position (fig. 38). This movement may be performed from other initial positions, such as ride sitting or loin lean stride kneeling.

The effects on the abdomen and thorax are similar to those in the case of the last exercise. The lateral flexors of the trunk are alternately passively elongated and shortened.

Exercises which, like the above, consist in a passive alternating flexion and extension of the trunk, have always been regarded by the Ling school as having a sedative effect on the brain, and thus tending to remove insomnia.[1]

[The term ringing has also been applied to sit lying knee extension and flexion, PP (see p. 68).]

[1] *Cf.* Hartelius, "Lärobok i Sjukgymnastik," 1870, p. 106 ; 1883, p. 109 ; 1892, p. 109.

ABDUCTION AND ADDUCTION.

(1) Of the Shoulder-joint.

Modern anatomists are still somewhat at variance regarding the mechanism of these movements. It used to be laid down that the first half of the movement up to the horizontal was accomplished by movement at the gleno-humeral joint, the scapula being fixed, and that the second half depended solely on rotation of the scapula. This explanation, however, is manifestly incorrect; it implies that the scapula would rotate through an angle of 90°, so that at the conclusion of the movement its vertebral border would be horizontal, which is contrary to what actually obtains. At a later period certain observers stated that the scapula rotated most during the first half of the movement and least during the last quarter.[1]

As a matter of fact there are two methods of performing the movements of abduction and adduction of the shoulder, just as in the case of flexion and extension of that joint:—

(i) As during every-day life, the scapula not being fixed.

(ii) As during gymnastic exercises, the scapula being kept drawn inwards and backwards.

In the former of these two cases the facts are as stated by the authors just referred to; in the latter the details are as follows:—

(*a*) During the first part of the abduction up to yard position. The scapula remains immovable, and the movement takes place only at the gleno-humeral joint.

(*b*) During the second part of the abduction up to stretch position. At first the movement is effected almost exclusively by

[1] *See*, for example, Cathcart, "Movements of the Shoulder-girdle involved in those of the Arm on the Trunk," in *Journ. of Anat. and Phys.*, 1884, vol. xviii., pp. 211, &c. Cleland, "Notes on Raising the Arm," *ibid.*, p. 275. Cleland and Mackay, "Human Anatomy," 1896, pp. 155 and 267. Dalla Rosa, "Physiologische Anatomie des Menschen," 1898, vol. i., p. 283. Mollier, "Über die Statik und Mekanik des menschlichen Schultergürtels unter normalen und pathologischen Verhältnissen," 1899. Steinhausen, "Beiträge zur Lehre von dem Mechanismus der Bewegungen des Schultergürtels," in *Archiv. f. Anat. u. Phys., Physiol. Abth., Suppl. Bnd.*, 1899, pp. 403, &c. Gray, "Anatomy, Descriptive and Surgical," 1901, p. 235.

rotation of the scapula, the gleno-humeral joint participating very slightly indeed. Then the scapula rotates less and less in proportion to the movement at the gleno-humeral joint, the final stage being effected almost exclusively by movement at the latter.

During the reverse movements the reverse takes place.[1]

The reasons for keeping the scapula drawn inwards and backwards are the same as those given on pp. 45, 46.

Fig. 39.

The amount of internal rotation of the humerus that is present in the original position (*i.e.*, where the arm is hanging vertically downward) will, if kept constant, render it impossible for the arm to be fully abducted. A certain amount of external rotation of the humerus must take place in order to enable the arm to be brought into stretch position.

From the standpoint of medical gymnastics the movements of

[1] *Cf.* Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, pp. 206, 229, 230.

abduction and adduction of the shoulder-joint may be divided into two classes: (*a*) without co-movement of the elbow-joint; (*b*) with co-movement of the elbow-joint. Two examples of each will be described.

Ride Sitting Double Arm Abduction, AR, Adduction, PR.

The patient assumes the ride sitting position; the assistant grasping the patient's wrists, performs traction away from the shoulder and resists while the patient abducts his arms through yard position (with the palms of his hands looking directly forwards) up to stretch position (where the palms should look directly towards each other). The reverse movement is then executed, generally with PR, although it may be given with AR (fig. 39).

Alternate abduction and adduction of the shoulder-joint takes place with a certain amount, respectively, of external and internal rotation of that joint and supination and pronation of the radio-ulnar joints. If the movement be executed as above, the abductors are exercised, but if executed as abduction AR, adduction AR, then first the abductors and then the adductors are brought into play. The chest alternately increases and decreases in size. The effect on the venous and lymph flow is practically the same as in the case of arm raising (pp. 48, 49).

Swim Sitting Double Elbow Pressing Downwards, PR, Upwards, AR.

The patient assumes the swim sitting position; the assistant keeping up traction away from the shoulders, presses over the upper aspect of the elbow-joints, so as to cause adduction of the upper arms through a right angle, *i.e.* until they lie against the sides, the patient continually resisting and keeping his elbows well back. The reverse movement is then executed with AR (fig. 40). Adduction and abduction (but not rotation) of the shoulder-joint takes place, the muscles called into action being its abductors.

Half Lying Double Arm Bending and Stretching, AR.

The patient assumes the stretch half lying position with the palms of the hands looking either directly away from one another or directly forwards (more rarely directly towards one another).

The assistant grasps the patient's hands in his own and resists, while the patient, keeping his upper arms and forearms in the coronal plane, adducts the former and flexes the latter, until the maximum of these movements is obtained. The amount of pro-

Fig. 40.

Fig. 41.

nation adopted in the initial position should be kept constant. The reverse movement is then executed with AR (fig. 41).

During the bending the adductors of the shoulders and the flexors of the elbows are placed in action; during the stretching their antagonists are called into play. With persons not accus-

tomed to the exercise, there is a tendency for the pectoral muscles to draw the elbows forwards, and this tendency is greater when the forearms are supinated than when they are pronated; in the latter case the posterior scapular muscles have a tendency to work harder than the pectorals.

Double arm bending and stretching, AR, may be given from initial positions that entail greater exertion, such as stretch sitting (with the back unsupported), or stretch arch forwards lying; under these circumstances the erectors of the spine (in addition to the above-mentioned muscles) are especially affected.

Hanging Trunk Raising with the Arms, PA.

The patient assumes the hanging position, generally with the palms of the hands looking forwards (*i.e.*, the forearms are pronated), although under certain conditions they may look backwards (*i.e.*, the forearms are supinated). The patient raises himself up towards the bar by adducting his shoulder-joints and flexing his elbows to the maximum, keeping the trunk and legs still. The reverse movement is then executed.

The adductors of the shoulders and flexors of the elbows (see p. 50) are first concentrically and then excentrically contracted.

Abduction and adduction of the shoulder-joint also enter into certain other movements, such as (1) standing double arm stretching outwards, PA (p. 53); (2) walk standing double arm circling, PA (p. 130), &c.

(2) Of the Thumb and Fingers.

Abduction and adduction of the thumb can be prescribed in cases of weakness of the muscles that perform these movements.

Abduction and adduction of the fingers can be prescribed to exercise the interosseous muscles; the dorsal interossei are called into action in abduction, AR, adduction, PR, the palmar ones in abduction, PR, adduction, AR.

(3) Of the Hip-joint.

Lying Double Leg Abduction, AR, Adduction, PR.

From the lying position the patient, keeping the knees fully extended, separates his legs (*i.e.*, performs abduction of the thighs), while the assistant, supporting the heels, applies resistance over their outer aspect with traction away from the pelvis.

Adduction is then executed with PR. This movement may also be executed from half lying position.

The abductors of the hip-joint are exercised. If the heels are not supported by the assistant then the patient has also to call into action the flexors of the hip-joint and fixators of the pelvis.

Side Lying Leg Lifting, AR, Pressing Down, PR.

The patient assumes the side lying position. The assistant applies one hand over the outer surface of the ankle of that leg

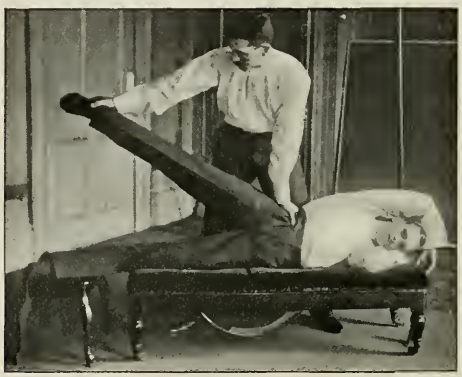

Fig. 42.

which is uppermost; with the other hand he steadies the hip. He then performs traction away from the pelvis, and resists while the patient abducts his leg as much as possible (see p. 44), after which the reverse movement is executed with PR. The pelvis must be kept immovable, otherwise some flexion or extension of the hip-joint will enter into the movement (fig. 42).

The muscles required to fix the pelvis and the abductors of the hip-joint are placed in action.

Lying Double Leg Flexion, PA, Abduction, AR, Adduction, PR.

The patient assumes the lying position, and then performs double leg flexion, PA, through an angle of about 30°. Steadily

maintaining this degree of flexion, he separates his legs as far as possible while the assistant, keeping up traction away from the pelvis, resists over the outer aspect of the heel. The reverse movement is then executed with PR (fig. 43).

The flexors and abductors of the hip-joint and fixators of the pelvis are exercised.

Fig. 43.

Crook Half Lying Double Knee Abduction, AR, Adduction, PR.

From the crook half lying position the patient separates his knees as far as possible, keeping his heels together all the time, with AR over the outer side of the knee-joint. The reverse movement is then executed with PR (fig. 44).

At first abduction with external rotation of the hip-joint takes place, and then the reverse. The muscles actively engaged are the abductors, and some of the external rotators of the hip-joint. The psoas and iliacus are not in action.

The above exercise may be performed while the patient lifts himself off the couch somewhat, resting on his shoulders and heels. Under these circumstances he lifts up the whole pelvic floor and levator ani, an action that exerts a powerful corrective effect on tendencies to prolapse of the rectum (and in female patients of the vagina and uterus).

Fig. 44.

This exercise may also take the form of abduction, PR, adduction, AR, *i.e.*, the patient resists while the assistant (whose hands are placed on the inner aspect of the knee-joints) separates his knees, and then the reverse. By these means, blood is sent to the pelvic organs, whereas in the former case (abduction, AR, adduction, PR), blood is drawn away from them (*cf.* Thure, Brandt[1]).

[1] "Massage bei Frauenleiden," 1897, pp. 99, 100.

ROTATION (TURNING).

By the above term is meant rotation on the axis which is vertical in the fundamental standing position.

I.—Of the Upper Extremity.

(1) At the Shoulder-joint.

Rotations at this joint can be given with the arm in heave position and the elbow supported. The assistant's grasp is over the wrist-joint, and by means of movements of the forearm through the sector of a circle (the centre of which is the elbow) passive or duplicate movements of internal and external rotation of the humerus are accomplished.

In internal rotation, AR, external rotation, PR, the sub scapularis, pectoralis major, latissimus dorsi and teres major are exercised; in external rotation, AR, internal rotation, PR, the teres minor and infraspinatus are in action.

(2) At the Wrist-joint.

Anatomy text-books as a whole ignore the possibility of passive rotation at this joint. That it exists, however, can easily be demonstrated. The radius and ulna are fixed by the assistant's one hand; the other, grasping the hand of the patient, turns it first in one direction and then in the other.[1] Such passive rotation of the wrist-joint can be used in order to free that joint in cases of adhesions, stiffness, &c. Active rotation of the wrist is, of course, impossible.

II.—Of the Lower Extremity.

(1) At the Hip-joint.

The patient is usually in half lying position; the toes are moved through the arc of a circle whose centre is the heel. The

[1] Wide is not aware of the fact that such rotation exists. *See* "Handbok i Medicinsk Gymnastik," 1896, p. 358; "Handbook of Medical Gymnastics," 1899, p. 207; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 299; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 297.

knee-joint being fully extended rotation at these joints is rendered impossible; the whole movement is in consequence transmitted to the hip-joint.

To convert the exercise into a duplicate one resistance is applied over the outer side of the metatarsus in the case of external rotation, AR, and over the inner side in the case of internal rotation, AR; or, better still, over the outer and inner surfaces of the knee-joint, as in the latter case traction can be more effectually applied. One of the assistant's hands is placed over the knee-joint, as mentioned, while the other guides the foot in its course, both performing traction away from the hip.

The muscles exercised are the external and internal rotators of the hip-joint respectively. When the assistant's grasp is over the foot alone, the eversors and inversors respectively of the tarsal joints are placed in action in order to maintain the position of the foot.[1]

(2) At the Knee-joint.

Rotation exercises are not often applied to this joint, as the muscles performing the movements can be exercised in other ways.

III.—Of the Head.

The assistant places one hand on the patient's forehead and the other over his occiput (as in fig. 45). Applying traction upwards all the time, the patient's head is first turned to one side, and then to the other, passively or with resistance as the case demands. The movement chiefly affects the joint between the atlas and axis. In order to prevent over-extension of the spinal cord, the head sinks somewhat during the rotation, and becomes elongated again during the reverse movement.[2]

The muscles used to perform the turning are those which rotate the joint mentioned, and those which rotate the cervical vertebræ.

[1] Wide states that in this exercise most of the muscles of the leg are put into action. *See* "Handbok i Medicinsk Gymnastik," 1895, p. 118; "Handbook of Medical Gymnastics," 1899, p. 117; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 111; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 125.

[2] Henke, "Handbuch der Anatomie und Mekanik der Gelenke," 1863, p. 96.

Rotations of the head combined with flexion may also be given (see flexion, p. 75).

IV.—Of the Trunk.

Loin Lean Stride Standing Alternate Rotation, AR.

The patient assumes the initial position with neck firm. The assistant grasps the patient round the elbows, and lifting the trunk upwards brings it passively into turn position. The reverse movement is then executed with AR in front of the

Fig. 45.

posterior elbow and behind the anterior one (more especially the latter), with traction upwards as before. The whole process is repeated on the other side (fig. 46). This movement may also be performed from ride sitting or loin lean stride kneeling position.

In this exercise the trunk is rotated on the vertebral column in its dorsal region. Suppose the patient to be placed in right turn position; the muscles which bring him back to the original position may be classed in three great divisions:—(1) External

oblique and external intercostals of the right side. (2) Internal oblique and internal intercostals of the left side. (3) Rotator muscles of the trunk, *i.e.*, multifidus spinæ and rotatores spinæ of the right side, semi-spinales of the left side, &c.

In addition, the posterior scapular, upper dorsal and cervical extensor muscles are powerfully contracted in order to maintain the position of the arms and head.

Fig. 46.

The effects are similar to those induced by lateral flexion of the trunk (p. 84). The abdominal contents are stimulated directly and reflexly (see p. 78); the flow in the portal vein, inferior vena cava, lower two azygos veins and the intercostal veins is promoted. The lymph flow in the abdomen and intercostal spaces is furthered. The spinal cord is probably stimulated and its venous circulation promoted.

PRONATION AND SUPINATION.

These movements occur only with regard to the radio-ulnar joints.

The patient's forearm is flexed to about a right angle, in order to eliminate as much rotation as possible at the shoulder-joint.[1] The assistant then fixes the elbow-joint with one hand, and with the other grasps that of the patient as if he were going to shake hands; the movements of pronation and supination, passive or duplicate, are then executed (fig. 47 shows supination, AR, pronation, PR).

FIG. 47.

In ordinary life, pronation and supination are effected by first grasping some object with the hand and then trying to turn it one way or the other. This means that the flexors of the fingers and fixators of the wrist-joint are called into action. With regard to supination it is not usually mentioned in text-books that the triceps has to work hard in order to counteract the tendency on the part of the biceps to produce flexion of the elbow-joint.

[1] It cannot be entirely eliminated; a slight amount of rotation at this joint always enters into pronation and supination. *See* Hultkranz, "Das Ellenbogengelenk und seiner Mekanik," 1897, pp. 81, 82.

In the exercise of pronation, AR, and supination, AR, with the assistant's grasp as above, the pronator group and some of the flexors of the front of the forearm, and the supinator group and some of the extensors on the back of the forearm are respectively in action. The flexors and extensors of the forearm can, however, be eliminated by transferring the grasp of the assistant to above the wrist-joint, in which case there is complete isolation of the pronator and supinator group respectively.

INVERSION AND EVERSION.

These movements only occur in connection with the foot. The patient is usually placed in half lying position with the lower leg fixed by the assistant's one hand in the same way as in foot flexion and extension (p. 69), the other hand being placed over the inner side of the foot in inversion, AR, and eversion, PR, and over the outer side in inversion, PR, and eversion, AR. In every case traction away from the lower leg should be maintained while the movements are being executed.

The muscles brought into action are the inversors and eversors of the foot respectively. The movement takes place chiefly at the mediotarsal joint.

CIRCUMDUCTION OR ROLLING.

The range of movement obtained by rolling is greater than that obtained from the other classes of exercises.

I.—Circumduction of the Upper Extremity.

(1) Of the Shoulder-joint.

Half Lying Double Arm Rolling, PP.

(Also called Arm "Flying.")

The patient assumes the stretch half lying position, with the forearms either in the mid-position or pronated. The assistant grasps the patient's hands in his own and performs a series of circumductions of the shoulder-joints by causing the elbows to describe a circle, as follows:—

(1) He extends the patient's shoulders and flexes the elbows until the upper arms lie against the side of the thorax and the forearms are in extreme flexion.

(2) By drawing the patient's hands outwards and upwards, thus bringing about abduction of the shoulders and extension of the elbows, he gets the patient's arms into heave position.

(3) Finally, by drawing the patient's hands upwards and inwards, completing the movement mentioned in (2), he brings the arms back into the original position (see fig. 41, p. 92).

The division into three parts is merely for the sake of clearness of description; in practice the rolling should be done as evenly and continuously as possible, its various phases merging into one another without a break.

The movement is repeated from six to ten times, this constituting the first half of the exercise ("from within outwards"). It is then executed a like number of times in the reverse direction ("from without inwards"). The whole process is then repeated.

This exercise may be carried out quickly and energetically. Its effects are then as follows:—

The muscles of the whole limb and shoulder girdle are exercised, and become better supplied with blood; the nerves are stimulated; the joints involved are rendered more supple, and any stiffness, deposits (gouty or otherwise), or adhesions that may be present will tend to be removed. The circulation in the arteries and veins will be furthered, the latter being partly affected by Braune's suction and pumping apparatus (described on p. 48). An additional effect is produced on the venous flow through the inertia of the blood and the presence of valves in the veins. While the arm is passing from stretch position downwards towards the body, the venous blood of the forearm, which tends to accumulate in the hand in consequence of its inertia, is prevented from doing so because of the valves in the veins, and thus moves in unison with the forearm. When the arm is drawn up again the blood in the forearm continues to move towards the heart by its own inertia. A similar mechanism comes into play in leg rolling (see p. 107). The lymphatic circulation in the arm is promoted, and the onward passage of the contents of the thoracic duct is hastened (p. 49). The exercise also acts beneficially on the respiratory apparatus from the alternate lifting up and down of the chest.

This exercise may be carried out slowly, *e.g.*, in the case of heart disease patients, in whom it is desired to produce the reaction slowly, or if it is intended to convert the exercise into a purely respiratory movement. In the latter case the patient inspires deeply as the arms are brought into stretch position, and makes a deep expiration when the process is reversed. Under such circumstances the stimulatory effects on the arms are not so great as when the movement is executed rapidly; the exercise, becoming identical with a passive chest expansion, acts chiefly on the lungs.

Sitting Arm Circling, PP.

In the movement just described it is impossible to apply any traction excepting at the very moment that the arms are brought into stretch position. If, therefore, an inflammatory condition of the shoulder-joint or a freshly-reduced dislocation be under treatment, it may be necessary to give the rolling in such a position and in such a way that traction of the arm away from the shoulder can be exercised. This is effected by placing

the patient in the sitting position; the shoulder of the arm that is to be rolled is fixed by the assistant's one hand; if necessary, his fingers are placed round the head of the humerus to prevent re-dislocation. His other hand is used to grasp the forearm just below the elbow-joint, which he semi-flexes, at the same time abducting the humerus to about a right angle. Then, performing traction away from the shoulder, the assistant moves the elbow in a gradually increasing circle first in one direction and then in the other (fig. 48).

FIG. 48.

This movement is executed slowly and through a comparatively small radius; its main effects, therefore, are the furthering of the venous and lymphatic flow and the prevention of adhesions and inflammation in the neighbourhood of the shoulder-joint.

Should a case arise demanding even greater traction, arm circling may be carried out with the arm in yard position, *i.e.*, the elbow is fully extended. The patient is then conveniently in half lying position. The assistant uses one hand to fix the patient's shoulder, and the other grasps the patient's hand (fig. 55). Applying traction of the latter away from the trunk, the assistant moves it in a gradually increasing circle first in one direction and then in the other.

Arm circling as just described may also take place, in order to free the shoulder-joint, with the arm in stretch position, or in any phase intermediate between that and yard position.

Walk Standing Double Arm Circling, PA.

(See p. 130.)

(2) Of the Wrist-joint.

Sitting Hand Rolling, PP.

The patient's forearm is fixed horizontally by the assistant with one hand, his other hand being used to grasp the patient's

Fig. 49.

fingers. Keeping up traction away from the forearm, the assistant performs circumduction of the hand at the wrist-joint six to ten times, first in one direction and then in the other (fig. 49). The whole process is then repeated.

This movement is a combination of passive palmar, dorsal, ulnar, and radial flexion, together with rotation,[1] at the wrist-joint. Circulatory, muscular, nervous, and other effects, as regards the hand and forearm, are as already described.

(3) Of the Thumb and Fingers.

(*a*) The thumb is rolled together with its metacarpal bone, as there is only a small amount of circumduction possible at its

[1] *See* p. 97.

metacarpo-phalangeal joint. To execute the movement the wrist-joint and other metacarpals must be fixed; the assistant grasps the terminal phalanx of the thumb, and while keeping up traction away from the wrist performs the rolling first in one direction and then in the other.

The movement takes place in the joint between the first metacarpal and the trapezium. The muscular, circulatory, nervous, &c., effects are as previously described.

(*b*) The fingers may be rolled in a similar manner, with their corresponding metacarpal bone fixed (fig. 50). The circumductory

FIG. 50.

movement takes place in the metacarpo-phalangeal joint. The effects are on the lines indicated.

When it is desired to apply greater traction than accompanies the above methods, this can be effected by transferring the grasp of the assistant's one hand from the terminal to the first phalanx.

II.—Circumduction of the Lower Extremity.

(1) Of the Hip-Joint.

Half Lying Leg Rolling, PP.

(This exercise can also be carried out with both legs at once.)

The patient assumes the half lying position with neck firm. The assistant, grasping the foot and knee as in the case of half

lying leg flexion, PP, extension, AR (see p. 64), performs a series of circumductions of the hip-joint by causing the knee to describe a circle. This is effected as follows :—

(1) He performs flexion of the knee and thigh to nearly the maximum extent.

(2) Then he rotates the thigh outwards and abducts it.

(3) Finally he draws the foot directly away from the trunk and brings the limb back to its original position by means of internal rotation, adduction, and extension of the thigh, and extension of the knee.

The heel should throughout be kept in the middle line.

The division into three parts (just as in the case of arm rolling) is merely for the sake of clearness of description ; in practice the rolling should take place as evenly and continuously as possible, the various phases merging into one another without a break.

The movement is executed six to ten times according to the above description (from within outwards), and then the same number of times in the reverse direction (from without inwards). The whole process is then repeated.

The effects of this exercise as regards the muscles, nerves, lymphatic and blood circulation, joints, &c., are similar to those described in connection with passive movements (pp. 38, 39). Mention has also been made of the special mechanisms that aid the flow in the popliteal and femoral veins (pp. 59, 64, 65), and of the mechanism in the lower leg, which consists of a combination of inertia of the blood and valves in the veins (p. 104).

In the case of moderate stiffness or inflammation at the hip-joint the movement should be given more slowly, and with traction away from the pelvis; the latter is applied by the assistant placing one hand in the bend of the knee, and drawing the thigh away from the trunk while the rolling is performed. When this exercise is given slowly the stimulatory effects are not so marked as when it is given rapidly.

In the case of very great pain or acute inflammatory state of the hip-joint (where even the rolling just mentioned cannot be carried out), the movement can be performed as follows :—The patient's knee being fully extended, the assistant grasps the foot and draws it directly away from the pelvis; by moving it in a gradually increasing circle first in one direction and then in the

reverse, he causes a circumductory movement to take place at the hip-joint. The effects are similar to those that take place in sitting arm circling, PP.

(2) Of the Foot.

Half Lying Foot Rolling, PP.

The position of the patient and the grasp of the assistant are the same as for half lying foot flexion and extension (p. 69). The assistant performs circumduction of the foot first six to ten times in one direction, and then the same number of times in the reverse direction; the whole process is then repeated.

The rolling takes place in the ankle and tarsal joints; no movement should take place in the hip-joint, as due fixation of the lower leg prevents any transmission of the rotation up the leg. The muscular, circulatory, nervous, &c., effects are the same as already indicated with respect to the foot and lower leg.

Half Lying Double Foot Rolling, PP.

(The same movement as the last, but involving both feet at once).

The position of the patient and the assistant's grasp are the same as for half lying double foot flexion and extension (p. 70). The assistant performs circumduction of both feet simultaneously, first, six to ten times in one direction, and then the same number of times in the reverse direction. The whole process is then repeated.

The effects are similar to those obtained from the last exercise, although not so marked. This is because, the lower legs not being so completely fixed, the movement cannot be accomplished so energetically and through so great a range; otherwise the hip-joints rotate in unison with the rolling of the foot, a result distinctly undesirable, and one which must be avoided as much as possible.[1]

[1] Compare Wide, "Handbok i Medicinsk Gymnastik," 1895, p. 132; "Handbook of Medical Gymnastics," 1899, p. 131; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 124; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 139.

(3) Of the Toes.

The corresponding metatarsal bone being fixed, the toe is rolled in the same manner as the fingers (see p. 107). The effects are as already described.

III.—Circumduction of the Head.

Sitting Head Rolling, PP.

The assistant with one hand over the patient's occiput and the other over the forehead (as in fig. 45, p. 99), slowly rolls the patient's head first in one direction and then in the reverse direction, continually keeping up traction away from the trunk. Unlike the other rollings, this kind is never given energetically.

This movement is a combined one of flexion and extension of the occipito-atlantal joint, rotation of the atlanto-axial joint, and flexion forwards, sideways, and backwards of the cervical vertebræ.

The effects on the muscles and nerves of the neck and vessels of both neck and brain are as already described (p. 73). This movement is depletive for the brain.

IV.—Circumduction of the Trunk.

Ride Sitting Screw Turning, PP.

This movement is a combination of flexion forwards and extension backwards, lateral flexion and rotation of the trunk, and is performed as follows :—

The patient assumes the ride sitting position with neck firm and the feet fixed. The assistant's grasp is at first the same as for alternate rotation (see p. 99), and he begins by rotating the patient's trunk to one side (say to the right) until the patient reaches right turn position (fig. 51). Thereupon he leaves hold of the patient's right elbow, and places his right forearm across the right half of the patient's back, and his right hand in the right axilla. Then he also leaves hold of the patient's left elbow and places his hand on the patient's left thigh to steady him. After this he swings the patient's trunk round so that the patient's head describes a circle the direction of which is positive as seen from above, and the centre of which is the position his head would occupy if placed in ride fall sitting position. While

doing this, the assistant simultaneously performs rotation of the trunk on itself also in a positive direction as seen from above, so that at the completion of the circle it is in left turn position

Fig. 51.

Fig. 52.

(fig. 54). The assistant then rotates the patient back again to the original position. The screw turning is given three times in the same, and then three times in the reverse direction.

The assistant's grasp varies somewhat during the different stages of the movement, and is best gathered from the illustrations (figs. 51 to 54).

Fig. 53.

Fig. 54.

This movement is a complex one, and its chief component parts are as follow :—

(*a*) Extension of the trunk at the hip-joints through a range of about 90°, and the reverse movement.

(*b*) Complete rotation of the trunk from right turn to left turn position, and *vice versâ*.

(*c*) Some lateral flexion of the trunk and the reverse movement.

The sum of these operations is circumduction of the trunk. Both the abdominal and thoracic contents are stimulated. The effect is, in fact, a combination of the effects obtained from passive falling backwards and the reverse, passive alternate rotation and ringing.

TRACTION.

During all duplicate movements, wherever possible, the assistant keeps up traction of the part exercised by drawing its distal free end away from its proximal fixed end. This traction has already been described and repeatedly insisted on, and the physiological effects of the process have also been considered (pp. 27, 28).

Under the heading of traction will be described some passive exercises used especially in order to stretch certain parts. During all of them, unless otherwise stated, the patient should offer no resistance to the stretching, but on the contrary should try to remain as passive as possible.

Arm Traction Sideways, PP.

The assistant, fixing the patient's shoulder, grasps the patient's hand and brings his arm into yard position. He

FIG. 55.

then draws the patient's hand directly away from the trunk and maintains this traction for a few seconds (fig. 55). The result is stimulation of the whole extremity. The cords of the brachial plexus as they lie in the axilla can be felt to become very tense during the application of the traction.

This movement may also be administered as partly duplicate, in which case the assistant first performs traction of the patient's arm as above, and then the patient, keeping his trunk still, tries to draw the arm towards himself with AR. At first stimulation of the arm results from the traction, after which almost all the muscles that pass from the clavicle and scapula to the humerus are actively contracted. This movement is very suitably made use of just after reduction of dislocations of the humerus.

Stretch Half Lying Double Arm Traction, PP.

The patient assumes the stretch half lying position. The assistant, grasping the patient's hands in the same manner as for double arm bending and stretching, AR, and double arm rolling, PP, draws them away from the shoulders in the plane in which they are lying, and maintains this traction for a few seconds.

The effect is stimulation of the whole of the arm, and, in a minor degree, stimulation of the trunk.

The above manipulation is not carried out separately, but is both a convenient introduction and sequel to the exercises just mentioned.

Side Lying Leg Traction, PP.

The assistant grasps the foot of that leg of the patient which lies uppermost, and drawing it directly away from the pelvis, maintains this traction for a few seconds, thereby stimulating the entire limb, and to a less extent the lateral half of the trunk of the same side.

Stretch Half Lying Double Hand and Foot Traction, PP.

The patient assumes the stretch half lying position, with the palms of the hands looking directly forwards. Two assistants, one grasping the patient's hands, and the other his feet, stretch the patient by simultaneously pulling in opposite directions for a few seconds (fig. 56). The effect is stimulation of the trunk and limbs as a whole.

Fig. 56.

When the patient is a strong subject, and the amount of traction applicable proves sufficient to lift him off the bench, the initial position can be made the stretch lying one instead of that specified above.

Stretch Side Lying Hand and Foot Traction, PP.

Two assistants, one grasping the patient's uppermost hand, and the other his uppermost foot, proceed as before (fig. 57).

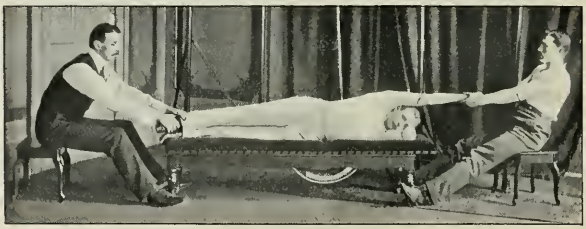

Fig. 57.

The effect is stimulation of those limbs and that lateral half of the trunk which lie uppermost.

All the foregoing tractions may be administered with simultaneous vibration of the part (see p. 189). (See also vibrations and shakings of joints, p. 194.)

(ARM-) CARRYING.

This is a term used to denote certain movements of the arm at the shoulder-joint. Two examples will be given.

High Sitting Double Arm Carrying Outwards, AR, Inwards, PR.

The patient assumes the high sitting position with his back supported. He first brings his arms into reach position, and then, with AR over the dorsal aspect of the metacarpals, carries his

Fig. 58.

arms horizontally outwards and backwards as far as possible, keeping the shoulders drawn well down and back. The reverse movement is then executed with PR (fig. 58).

This movement is given chiefly to expand the chest, in consequence of the powerful action of the muscles that pass from the

trunk to the scapula and from the scapula to the humerus posteriorly; the posterior muscles of the forearm are also exercised. The movement at the shoulder-joint is not an ordinary simple one of flexion, or abduction, or rotation, &c., nor is it circumduction. It is a kind of eighth movement of that joint, and consists in the gliding of the head of the horizontally-held humerus on the glenoid fossa, the line of contact being approximately represented by about the anterior two-thirds of a line drawn from the upper end of the bicipital groove across the head of the humerus in the long axis of that bone.

During the arm-carrying outwards the scapula moves inwards a little, the reverse taking place during the reverse movement

Sitting Elbow Carrying Backwards, AR, Forwards, PR.

(Also called elbow *pressing* backwards, &c.)

This exercise is accomplished with one arm at a time. The patient places his upper arm in a position about midway between yard and reach positions, the rest of the arm being as in swim position. The assistant places one hand on the patient's shoulder to steady it, and the other over the lower end of the upper arm posteriorly. Then the patient, continually keeping the various parts of his arm horizontal, causes his elbow to pass backwards as far as he can with AR. The reverse movement is then executed with PR.

The muscles involved are chiefly the posterior third of the deltoid and the upper part of the triceps.

The movement at the shoulder-joint that takes place in the above two exercises is also found in reach grasp stoop fall standing double elbow flexion and extension, PA (p. 52).

DRAWING.

The explanation of this term is best obtained from the description of the various movements it comprises. There are three varieties: (1) drawing forwards; (2) drawing sideways; (3) drawing backwards. The first two of these are closely allied to one another, whereas the third is of quite a different nature.

I.—Drawing Forwards.

Stretch Grasp Standing Drawing Forwards, PP.

The patient assumes the stretch grasp standing position. The assistant stands in front of him and places his hands over the upper part of the patient's scapulæ, so that his palms lie in contact with them, and look directly forwards, the fingers at the same time pointing directly upwards. Drawing towards himself the assistant causes his hands to glide down the patient's back, keeping close to the spine in so doing, until the lumbar region is reached, when he brings his hands round the sides of the abdomen, the patient then either passively gliding back through them to the original position by means of his own weight and the elasticity of his body, or drawing himself back while the assistant resists. The patient's feet should touch the ground the whole time (fig. 59).

If, instead of beginning high up over the scapulæ, the assistant's hands were to start in the lumbar region, the exercise would be deprived of a great deal of its efficacy.

The effects are stretching of all the muscles, ligaments, nerves, vessels, &c., of the anterior part of the arms, trunk, and thighs, with a certain amount of stretching of the posterior part of the arms and trunk (including the spinal column), with subsequent relaxation of all these structures. The anterior abdominal muscles are first passively elongated and then passively shortened or concentrically contracted, according to circumstances. The abdominal viscera as a whole are stimulated in consequence of the

alternate stretching and relaxation and alternate application and removal of pressure. This movement is therefore conveniently given both as an introduction and a sequel to manipulations on many abdominal organs. It is, moreover, a chest expansion

Fig. 59.

exercise, in consequence of the lifting up of the arms to stretch position; the expansion is increased when the body is drawn forwards.

Heave Grasp Standing Drawing Forwards, PP.

The patient assumes the heave grasp standing position, and the assistant proceeds as in the case of the last exercise, taking care, however, that his manipulation is directed to expanding the chest, and not to pulling the abdomen forwards.

This movement is a chest expanding one (see p. 129).

II.—Drawing Sideways.

Side Span Standing Drawing Sideways, PP.

The patient assumes the side span standing position. The assistant, who stands as for drawing forwards, places his hands on the patient over the infra-axillary region nearest the apparatus, as in fig. 60, keeping his palms looking as much as possible directly forwards. Applying pressure towards himself,

Fig. 60.

the assistant causes his hands to glide down along the patient's body until they reach the crest of the ilium, thus drawing the patient at about his middle away from the ladder. He then lets his hands slip round the patient's body, which passes back to the original position either passively or by his own efforts, just as described under drawing forwards. When this exercise is properly administered the stretching is felt in the lateral aspect of both thorax and abdomen.

Stretching takes place of all the muscles, ligaments, nerves, vessels, &c., of the lateral half of the body remote from the ladder, with subsequent relaxation. The lateral flexors of the other side of the trunk are first shortened, and the spinal column slightly flexed so that its concavity lies towards the ladder. Then the spinal column returns to its original position either by the elasticity or concentric contraction of the flexors of the lateral half of the body which has been elongated.

This movement forms both a convenient introduction and sequel to many manipulations on abdominal organs, just as stretch grasp standing drawing forwards, PP.

III.—Drawing Backwards.

Loin Lean Stride Standing Drawing Backwards, PR, Forwards, AR.

The patient assumes the loin lean stride standing position with neck firm, and draws his abdomen well inwards and upwards, specially in cases of disease of the pelvic organs, or hernia through the anterior abdominal wall (see p. 82). The assistant grasps the patient's elbows and applies traction upwards; he then causes extension of the trunk backwards on itself, the patient meanwhile resisting somewhat and keeping his pelvis immovable and his knees quite straight. The amount of extension of the trunk on itself that can be effected varies in different cases. It should, however, never be carried out to its fullest extent, otherwise the inguinal canal would be drawn open and a hernia easily result. The reverse is then executed with AR (fig. 61).

This movement may also be performed from the loin lean stride kneeling position.

The anterior abdominal muscles, together with the psoas, are at first in excentric and then in concentric contraction.

The effect on the flow in the veins[1] and lymphatics of the thorax and abdomen and on the spinal cord and size of the spinal canal[2] are very similar to those which result from lateral flexion,

[1] *Cf.* Neumann, "Lehrbuch der Leibesübungen," 1856, part ii., p. 136, &c. Georgii, "Kinetic Jottings," 1880, pp. 112, &c.

[2] Reid and Sherrington, quoted p. 84.

alternate rotation, and ringing of the trunk. An interesting experiment in connection with the effect of this exercise on the arteries is quoted by Georgii.[1]

Fig. 61.

The actual movement that takes place is extension backwards (and then the reverse) of the trunk on itself, the hip-joints not participating (see classification of trunk flexions, p. 76).

[1] "Kinetic Jottings," 1880, p. 113.

EXPANSION.

This term is only applied to certain chest movements given for the purpose of developing the respiratory apparatus.

Every active movement, whether duplicate or not, involves chest expansion, as the cardinal rule must always be strictly attended to, "Keep the head up, the chin in, and the shoulders down and back as much as possible during the execution of each movement." Allan Broman,[1] writing on the subject of Ling's pedagogical gymnastics, says, "Every gymnastic exercise should be done under conditions of full and free breathing. An exercise which does not permit this is *bad* educationally, and should be eradicated. In fact, *every gymnastic exercise rightly executed is a respiratory movement.*"

This postulate of pedagogical gymnastics is of equal importance in medical gymnastics. It is necessary to pay so much attention to the respiratory function, because on it are dependent, to a greater or less extent, many vital phenomena.

The effects of respiration are briefly as follows :—

(1) On the Circulation of the Blood.

Respiration assists the onward progress of the blood in the pulmonary veins as follows :—During inspiration is established a negative pressure in the thorax (which may amount to as much as 70 mm. of mercury). This causes an increase in the size of the intra-pulmonary veins, and a diminished resistance to the flow in them ; a suction power arises and they fill up with blood drawn peripherally. During expiration is established a positive pressure in the thorax (which may amount to as much as 100 mm. of mercury) and the capacity of the veins is diminished. The contents of these veins are therefore driven in a centripetal direction into the left auricle. Thus the diastolic filling of the left auricle is aided by the respiratory peripheral force and suction pump.

[1] "School Gymnastics," 1902, p. 27.

Respiration also assists the onward progress of the blood in the systemic veins as follows:—The alternate increase and decrease in the intrathoracic pressure, as just mentioned, will alternately pump and force the blood out of the intrathoracic portion of the superior and inferior venæ cavæ and thus aid the work of the right auricle. The flow in the intra-abdominal portion of the inferior vena cava and its tributaries will be promoted by the descent of the diaphragm and the expiratory contraction of the abdominal muscles.

According to Lovén[1] the attachment of the walls of the inferior vena cava to the foramen quadrilaterum is such that with the descent of the diaphragm they are drawn apart, an increase in the capacity of the vein ensuing. "With sedentary persons who suffer from a congestive state of the large venous trunks an occasional deep inspiration is a powerful means of facilitating the circulation." (Lovén[2]). In the case of persons with very thin skins, the long saphenous veins can be seen to alternately fill and empty with the movements of respiration (Schweigger-Seidel[3]).

That the movements of the diaphragm further the blood supply in the liver and spleen, and also the onward progress of the contents of the stomach and intestines, has been shown by Hasse.[4]

(2) On the Flow of the Lymph.

Every inspiration induces increased intra-abdominal and decreased intrathoracic pressure; thus the contents of the abdominal part of the thoracic duct are emptied into the thoracic part. During expiration these changes of pressure are reversed; but the contents of the duct, in consequence of the valves, cannot pass backwards, and instead are driven onwards into the subclavian vein. There is an additional

[1] "Om Blodet," 1876, p. 47.

[2] *Op. cit.*, p. 46 (translated). *See also* Oliver, "The Blood and Blood Pressure," 1901, p. 180.

[3] Quoted by Brauue, "Die Oberschenkelvene des Menschen in Anatomischer und Klinischer Beziehung," 1873, p. 3.

[4] "Ueber die Bewegungen des Zwerchfells und über den Einfluss derselben auf die Unterleibsorgane," in *Archiv für Anat. und Phys., Anat. Abtheilung*, 1886, pp. 185-210; and "Ueber die Bauchathmung," *ibid.*, 1903, pt. i., pp. 23-26.

indirect effect of respiration on the lymph flow; the negative pressure induced in the intrathoracic venous trunks causes a suction of the contents of the thoracic duct into the subclavian vein, the establishment of a positive pressure not causing any reflux under ordinary circumstances owing to the competence of the valves at the orifice of the former. There is also a special mechanism in the diaphragm itself to further the lymphatic flow of the abdomen, as first shown by v. Recklinghausen[1] and shortly afterwards by others in Ludwig's laboratory.[2] In the central tendon of the diaphragm exist two sets of lymphatics, a superficial and a deep set, just as in every other tendon of the body. Each contraction of the diaphragm furthers the flow from one set to the other and from them into the larger trunks (as already described on p. 27). A similar arrangement of the lymphatics is found in the intercostal spaces (Dybkowski[3]).

Increase in the respiratory function goes hand in hand with increase in the capacity and function of the lungs (excepting in cases of emphysema, when improvement brings about reduction in their capacity), and consequently with increase in the amount of oxygen in the blood. The coronary arteries will in consequence bring a greater quantity of nutrient matter to the heart, which will become strengthened from this cause, as well as from the fact that the pulmonary and systemic circulations are furthered. Improved respiration, in fact, acts beneficially on the body as a whole.

In many patients the respiratory process is carried on defectively; often the upper part of the thorax is raised while the lower part does not move, the abdomen being drawn in. This is particularly the case with women addicted to tight lacing. In such patients the whole action of the diaphragm, and with it the greater part of circulatory improvement in the veins and lymphatics below the thorax, is lost.

It is unnecessary to consider in detail the practice of wearing

[1] "Die Lymphgefasse und ihre Beziehung zum Bindegewebe," 1862; "Zur Fettresorption," in *Virchow's Archiv*, vol. xxvi., 1863, p. 172, &c.

[2] *See* Ludwig and Schweigger-Seidel, "Über das Centrum Tendineum des Zwerchfells," in *Arbeiten a. d. Phys. Anstalt zu Leipzig*, 1866, pp. 174-181. Schweigger-Seidel und Dolgiel, "Über die Peritonealhöhle bei Fröschen und ihrer Zusammenhang mit dem Lymphgefässsysteme" in *ibid*, 1866, p. 68, &c. Schweigger-Seidel, "Die Behandlung der thierischen Gewebe mit Argentnitric," *ibid.*, 1866, p. 150.

[3] *See* p. 84.

corsets and other tight-fitting garments, as so much has already been written on this topic. The following are the main reasons for condemning it :—

(*a*) As stated above, the proper return of the lymph and venous blood from the parts below the thorax is hindered and the arterial supply to them diminished. There is a constant tendency to congestion of the head and chronic headache, specially on exertion; and thus the subject is disposed to limit exercise as much as possible.

(*b*) The anterior abdominal muscles are weakened through lack of exercise.

(*c*) The erector spinæ muscles are also weakened, and spinal curvatures can result much more easily.

(*d*) The organs of the abdomen proper are prevented from properly discharging their functions. Deformations of the liver from tight lacing are generally accorded a paragraph in text-books on pathology.

(*e*) The pressure on the pelvic organs and the tendency to stasis aid powerfully in predisposing to, if not, indeed, actually causing, pelvic disease, with a detrimental effect to the future generation. From unhealthy reproductive organs come unhealthy children.[1]

Low Sitting Chest Lifting (Expansion), PP.

The patient assumes the low sitting position. The assistant, standing behind and supporting the patient's back, grasps the upper arms as in fig. 62. Then, lifting them in an upward and backward direction, he causes the heads of the humeri to describe a circle whose direction is positive as seen from the right. This movement should be executed smoothly and evenly, and repeated with a pause of a second or so between each individual lifting some five or six times. During the elevation of the shoulders, the patient should inspire deeply, and during the reverse movement make a deep expiration.

The chest is passively enlarged by the assistant, and still more so by the patient's deep respiration.

[1] *Cf.* Hartelius', "Snörlifvets Skadliga Inverkan," in *Tidskrift i Gymnastik*, vol. ii., 1887, p. 667.

FIG. 62.

Heave Lean Standing Chest Expansion, PA.

The patient assumes the heave lean standing position with his chest well forward. The assistant, standing behind him, places

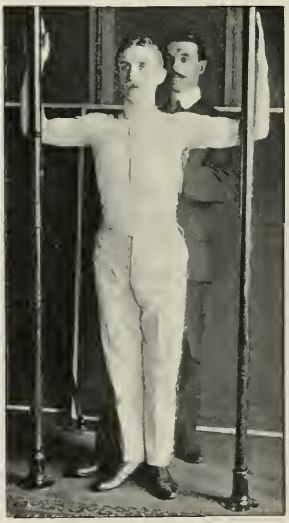

FIG. 63.

his hands on the scapulæ, and by applying pressure in an inward and forward direction approximates their vertebral borders, and thus helps in the expansion of the chest (fig. 63). The patient then rises on his toes, and while doing so takes a deep inspiration and leans forwards yet more by contracting his posterior scapular muscles, so as to still further expand his chest. This is aided by the pressure from the assistant being applied in an increasing degree. Then the patient sinks down on his toes again, with deep expiration, and the pressure from the assistant is somewhat relaxed; while sinking down, however, the patient should let his forearms move a little downwards. This process is repeated three times. Last of all, the arms are moved up against the poles with deep inspiration, until stretch lean position is reached, and then adducted with deep expiration.

When patients are unable to perform this exercise without getting the back lordosed during its execution, the forearms may be kept fixed throughout, instead of moving downwards after each rising on the toes.

This movement, as the name implies, effects expansion of the chest.

Heave grasp standing drawing forwards, PP, the effect of which is similar to the above, has been already described on p. 120.

Two other respiratory movements may conveniently be described here.

Stretch Grasp Toe Standing Hanging, Breathing, PA.

The patient assumes heave lean standing position, and then stretches his arms as high as possible and grasps the poles firmly, rising on his toes while doing so. He thus arrives at stretch grasp toe standing position. He then moves his feet backwards on the ground as far as possible, and, remaining in this position, supported by hands and toes, with body hanging quite relaxed and free from muscular contraction, takes three deep respirations. After this he executes the several stages of the movement in the reverse direction and order until he reaches the initial position (fig. 64).

A stretching of the whole of the body, especially of the abdomen, takes place, the chest being greatly lifted; this movement is especially a respiratory one.

FIG. 64.

Walk Standing Double Arm Circling, Breathing, PA.

From the walk standing position the patient brings his arms, which at first hang vertically downwards, through reach, stretch, and yard positions back to the original position. He inspires deeply during the first half of the movement up to stretch position; during the second half of the movement a deep expiration should be taken.

This exercise is a respiratory one. In cases of defects in the respiratory or circulatory apparatus (or often even without the existence of these) it should take place after every active gymnastic movement. In the latter case it should only be executed once each time, but as a separate exercise it should take place three times with one foot forwards, and then three times with the other.

The actual movement of the arms is circumduction of the shoulder-joint.

LIFTING.

Chest lifting has been described under expansion (p. 127).

Anal and rectal lifting will be described on p. 233.

Liftings of the female pelvic organs will be considered on pp. 235-237.

HEAD LIFTING.

Sitting Head Lifting, PP.

The patient assumes the sitting position. The assistant places one of his hands on the patient's forehead, and the thumb and forefinger respectively (or else the whole palmar aspect) of his other hand on each side of the occiput just below the superior curved line.

Performing traction of the hand away from the trunk, the assistant simultaneously extends the head a little backwards,

FIG. 65.

after which he lifts up the posterior part and flexes it a little forwards, keeping meanwhile his anterior hand as still as possible. He then partially releases the traction upwards and brings the patient's head to the vertical once more. The process is repeated several times. Particular care must be taken to flex the head on the cervical vertebræ, and not the latter on one another (fig. 65).

From the alternating elongation and shortening of the blood-vessels, the circulation through the brain is promoted, just as in the case of head flexion, PR, and extension, AR (p. 72). The venous return is also furthered by the special anatomical mechanism that exists in the attachment of the walls of the internal jugular vein to the sterno-mastoid (see p. 48); this exercise is therefore depleting for the head. The actual movement should be confined to the occipito-atlantal joint. The cervical part of the spinal column is stimulated, as is also the same portion of the spinal marrow. During the actual lifting there occurs in most patients some dilatation of both pupils.

SHAKING AND VIBRATION. FRICTION.

The manipulations specified in the heading of this chapter are most conveniently grouped together; for some structures allow of frictions and vibrations but not shakings, while others allow of shakings and vibrations but not frictions, and so on. This division of the subject comprises the consideration of some of the most important manipulations employed by Henrik Kellgren in the actual treatment of disease. It is especially by means of these particular manipulations that such conditions as acute specific infectious fevers are brought within the effective range of the manual treatment, and that so much more can be accomplished in such cases than is possible through any other method whatever.

A few of the forms of Henrik Kellgren's shakings and vibrations and a good many of his nerve frictions and vibrations have been described in the works of Arvid Kellgren.[1] These I shall re-describe in my own words; and in addition I shall enter into details concerning many other forms used by Henrik Kellgren which have hitherto not been described.

SHAKING.

Two or more digits (with or without the palm) are placed with their palmar aspect against the part to be treated, and remain in such contact throughout the manipulation; the joints of the fingers, wrist, and elbow are kept as loose as possible compatible with the correct execution of the movement. A rapid alternating contraction and relaxation of some of the muscles of the forearm in whole or in part, sometimes with co-action of the muscles of the upper arm, is then set up. (An exception is found in "gentle" shakings, in which the muscles of the forearm are passive, the movement involving only some of the shoulder-joint muscles.) The actual excursion of the movement

[1] "Vorträge über Massage," in "Statistischer Sanitätsbericht ... für 1888," pp. 163, &c., and "Technic of Ling's System of Manual Treatment," 1890.

at the wrist-joint in administering shaking varies under ordinary circumstances from about one-eighth of an inch to one inch. The amount of muscular force employed should be minimised whether the amplitude of the movement be large or small; otherwise the manipulation will become hard, jerky, and irregular, instead of being soft, elastic, and regular. The part under treatment is subjected to a series of rapid, wavelike movements of alternating application and removal of pressure. Were the assistant's hand removed with each relaxation, the part in question would not be shaken, but instead, subjected to a series of strokes resembling clapping (see pp. 197, &c.).

The following are the various forms of shaking :—

I.—*Up and down.*

(1) Gentle.
(2) Medium.
(3) Strong.

II.—*Side to side.*

(1) Gentle.
(2) Medium.

III.—*Rotatory.*

1.—*Shaking Up and Down.*

This is by far the most usual form.

(1) *Gentle.*—Is given from the finger and wrist-joints, which are alternately passively flexed and extended by means of alternating external and internal rotation of the shoulder-joint.

(2) *Medium.*—Is given from the same joints but the finger and wrist-joints are alternately *actively* flexed and extended. The amount of pressure applied is greater.

(3) *Strong.*—Is given chiefly from the wrist and shoulder-joints; the amount of pressure applied is proportionately greater.

Examples.—The first kind is illustrated by heart-shaking (p. 190), the second by subcostal shaking (p. 192). The third kind is not often resorted to, but may be used in certain cases calling for very strong stimulatory treatment.

II.—*Shaking from Side to Side.*

This is a method not often employed.

(1) *Gentle.*—Is given by means of alternating radial and ulnar flexion of the wrist-joint, the elbow-joint being kept as still as possible.

(2) *Medium.*—Is given by the same muscles (radial and ulnar flexors) as (1), but the wrist-joint is kept as still as possible; thus the movement chiefly takes place in the elbow-joint.

Examples.—These manipulations are sometimes resorted to on the head or over muscles.

III.—*Rotatory Shaking.*

This is a method employed to administer the passive movements of rotation at the wrist-joint, or of pronation and supination at the radio-ulnar joints, in the case of stiffness, &c. The

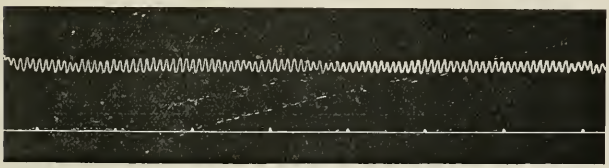

FIG. 66.

Time tracing, every two seconds.

assistant, having grasped the hand of the patient in his own, causes it to undergo a rapid alternating pronation and supination. If his other hand be used to fix the patient's forearm just above the wrist, the movement is transmitted exclusively to the wrist-joint; if, however, the patient's forearm be not fixed, but only the upper arm, the radio-ulnar joints are instead affected.

The rate at which shakings are administered may vary considerably; the maximum compatible with regularity over a long space of time is about 7 per second.

Figs. 66 and 67 give graphic representations of shakings. The records were made by means of an indiarubber ball placed

under the palm of the hand that administered the shakings. Every up and down movement of the palm caused air to be alternately drawn in and sent out of the ball; the variations in the volume of the latter were recorded by means of a Marey's tambour which was connected to it by means of a tube.

Fig. 66 represents shaking from the wrist and finger-joints. Fig. 67 represents shaking from the wrist and shoulder-joints.

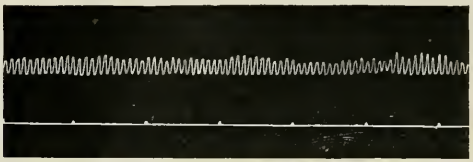

FIG. 67.

Time tracing, every two seconds.

VIBRATION.

The method of executing vibrations is similar to that described under the heading of shakings, but the excursion of the movement being smaller, a series of waves of considerably less amplitude and greater frequency is set up in the part that is being treated.[1] Vibrations are produced by alternate contraction and relaxation of antagonistic groups of muscles or of the same set of muscles. The actual excursion of the movement at the metacarpo-phalangeal and wrist-joints varies under ordinary circumstances from one-twentieth to one-eighth of an inch. The amount of muscular force employed should, just as in shakings, be minimised; with a gentle vibration the contraction of the flexors of the forearm should be only just perceptible to the sense of touch of another person.

[1] *Cf.* Wide, "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 73, who says—"Vibration . . . . is a weaker movement, so that the part of body in question does not undergo any real shaking, but remains at rest, whilst a shaking *upon* the same is made." *See also* "Handbok i Medicinsk Gymnastik," 1895, p. 66; "Handbook of Medical Gymnastics," 1899, p. 65; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1903, p. 63.

The following are the various forms of vibration :—

(A) Simple Forms.

(A) STATIONARY.

I.—*Up and down.*

(1) Generated from finger-joints.

(*a*) Very fine.

(*b*) Fine.

(2) Generated from wrist and finger-joints.

(*a*) Gentle.

(*b*) Medium.

(*c*) Strong.

(i.) With pressure applied from the elbow-joint.

(ii.) With pressure applied from the shoulder and elbow joints.

(*d*) Very strong, called pressure vibration.

(3) Generated from elbow-joint.

(*a*) Medium.

(*b*) Strong.

(4) Generated from shoulder-joint, &c. (?)

II.—*Side to side.* Generated from wrist-joint.

III.—*Rotatory.* Generated from radio-ulnar joints.

(B) RUNNING.

I.—*Slow.*

(1) Light.

(2) Strong.

II.—*Rapid.*

(1) Light.

(2) Strong.

(B) Complex Forms.

(1) Suction vibrations.

(2) Dispersing vibrations.

(3) Nipping vibrations.

(A) Simple Forms.

(A) Stationary Vibrations.

Are executed by one or more phalanges of one or more digits, which, having been placed with the palmar aspect on the part to be treated, set up a continuous vibration on the same spot.

I.—*Up and Down Vibrations.*

The movement may be generated from :—

(1) *The finger-joints.*—The movement is performed by the flexors of the fingers, the wrist-joint participating as little as possible. (*a*) If the excursion of the movement be kept to the minimum, there will result the most minute vibrations possible; these I have expressly termed "very fine." (*b*) A slightly larger excursion will proportionately increase the amplitude of the vibrations, which, however, can still be termed "fine." Such "very fine" and "fine" vibrations may be used in cases requiring great delicacy of manipulation, *e.g.*, in acute conditions of the eyes.

(2) *The wrist and finger joints.*—If the wrist-joint be allowed to participate as well as the finger-joints, then the flexors of both the wrists and fingers will be in action. (*a*) The "gentle" vibrations are produced by the excursion of the movement and the pressure applied being kept at the minimum. (*b*) "Medium" ones are produced by an increase in both. (*c*) "Strong" are produced by a still further increase. The pressure is in every case applied from the elbow-joint by means of contraction in the triceps, the shoulder being fixed.

The method just described is the most usual one of executing vibrations, and is employed unless indications exist for producing them in a different way.

(*d*) For the "very strong" or "pressure" vibrations, the tip of the thumb is used, the forefinger being applied to it so as to steady it. It is placed on the part to be treated and then vibrates while simultaneously strong pressure is applied. This manipulation is generally maintained for only a few seconds at a time; it is employed for some deep-seated nerves, such as the great sciatic in the buttock, in cases where powerful stimulation is required.

(3) *The elbow-joint.*—When it is necessary to lift a structure and then vibrate it, the manipulation is termed a "lift-vibration," and is generally given with the movement generated from the elbow-joint (see uterine lift-vibration, p. 237). The flexors and extensors of that joint are the muscles placed in action. According to the amplitude of the movement the vibrations are "medium" or "strong." This form of vibration is also found in the bitemporal movement (p. 217).

(4) *The shoulder, elbow, and wrist joints.*—In certain very rare cases, where strong stimulation becomes necessary, the vibration, with simultaneous pressure, may be generated from all the joints of the arm. This method, however, should never be employed on nerves[1] under any circumstances, as it to a great extent eliminates the fine sense of touch. It is, moreover, extremely tiring, and cannot be continued with evenness and regularity for more than a minute or so.

II.—*Side to Side Vibrations.*

Are executed by a rapid alternating radial and ulnar flexion of the wrist, the elbow being kept still. They may be employed when treating the head.

III.—*Rotatory Vibrations.*

Are given in the same manner and for the same conditions as rotatory shakings, but the movement is a much finer one, the amplitude being much smaller.

(B) Running Vibrations.

During the course of a running vibration the vibrating digit or digits, instead of remaining continually on one spot, are moved along a structure in the line of its long axis. Either the soft parts of the distal phalanges of the forefingers and thumb or else the backs of the nails of one or more fingers are employed. According to the speed and strength with which running vibrations are executed they are classified into "slow" and "rapid"

[1] Tokaroff erroneously supposes that this is the method ordinarily employed by Henrik Kellgren in treating nerves; *see* "Nerveuvibrationen, eine neue manuelle Behandlungsmethode," in *Allgem. Wien. Med. Zeit.*, 1888. *See also* Reibmayr, "Die Technik der Massage," 1898, p. 29.

forms, either of which may be "light" or "strong." The slow form is sometimes called a vibratory stroking, if used as a substitute for stroking over an œdematous or congested area (*see* pp. 180, 205).

(B) Complex Forms.

(1) *Suction vibrations.*—These are made use of when it is desired to prevent absorption by the tissues and to concentrate lymph in the part, to favour pointing of an abscess, &c. The fingers and thumb are spread well out round the area to be treated, as in fig. 68; then, being set into vibration, the metacarpo-phalangeal and interphalangeal-joints are flexed so that the fingers and

Fig. 68.

thumb, which move as one with the skin of the patient, are approximated to one another, a certain amount of pressure being meanwhile applied. With the extension of the joints of the fingers and thumb the pressure is removed, or the digits may be lifted right off the part until they are again in the original position, when the movement is repeated.

(2) *Dispersing vibrations.*—These are made use of when it is desired to favour absorption from small effusions, &c. They differ from the above (1) in this respect that the pressure is applied during the extension of the fingers and thumb, and removed during the flexion.

(3) *Nipping vibrations.*—These are used in connection with certain skin diseases in order to cause a gentle exudation of the

contents of the catarrhal cells of the skin. The skin is gently pinched between the forefinger and thumb, which vibrate simultaneously.

Vibrations may be administered with varying speeds, the maximum being about 12 per second, the minimum about 6 per second.[1] Figs. 69 and 70 give graphic representations of vibrations. Fig. 69 represents vibrations generated from the fingers,

FIG. 69.

Time tracing, every two seconds.

FIG. 70.

Time tracing, every two seconds.

the wrist-joint not participating. The method of recording was by means of an indiarubber ball, as described on p. 135, but placed under the finger-tips instead of under the palm. The rate can be seen to be about 12 per second. In fig. 70, with the indiarubber ball in the same position, vibrations from the wrist and finger-joints are represented, the rate being slightly less than 7 per second.

[1] Reibmayr erroneously gives the number of vibrations according to Kellgren's method as 200-300 per minute (*vide* "Die Massage und ihre Verwerthung in den verschiedenen Disciplinen der Praktischen Medicin," 1893, p. 14, and "Technik der Massage," 1898, p. 32). Saquet gives even a lower estimate, *i.e.*, "hardly more than 200 a minute" (*vide* "De la trépidation mécanique locale ou vibration," 1898, p. 2. *Also* Lavalette "De la sismothérapie," Thèse de Paris, 1899). Hj. Ling states that shakings and vibrations have a speed of about 1,000 per minute (*vide* "De Första Begreppen af Rörelselären," 1866, p. 149, and "Förkortad Öfversigt af Allmän Rörelselära," 1880, p. 71).

FRICTION.

(A) Nerve Friction.

The nerve to be treated must first of all be exactly located, if possible by the sense of touch.[1] Any muscles or other structures that lie over the nerve must be uncontracted and relaxed. The fingers are then drawn sharply across the nerve as much as possible at right angles to its long axis. The manipulation causes the nerve in question to be set into vibration. In the case of deep-seated nerves the fingers move in unison with the structures that lie over the nerves. In the case of cutaneous nerves, however, the fingers are moved across the skin in which they lie.

The following are the various forms of nerve friction:—

(A) Simple Forms.

(A) STATIONARY.

I.—*Slow.*

(1) Light.
(2) Medium.
(3) Strong.
(4) Very strong (called "pressure friction").

II.—*Rapid.*

(1) Light.
(2) Medium.
(3) Strong.

(B) RUNNING.

I.—*Slow.*

(1) Light.
(2) Medium.
(3) Strong.

II.—*Rapid.*

(1) Light.
(2) Medium.
(3) Strong.

[1] Reibmayr denies the possibility of being able to feel a nerve (*vide* "Die Massage und ihre Verwerthung in den verschiedenen Disciplinen der Praktischen Medicin," 1893, p. 16, and "Die Technik der Massage," 1898, p. 28, &c.) The only explanation of this is that either Reibmayr never tried to feel the ulnar nerve at the elbow, the facial nerve as it comes round the angle of the jaw, or the brachial plexus in the axilla, &c., or else he really failed to feel them after careful endeavour.

(B) Complex Forms.

(1) Friction vibrations.
(2) Friction vibrations with suction.

(A) Simple Forms.

(A) Stationary Nerve Frictions.

Are executed in the manner just described, and if repeated take place at precisely the same point in the course of the nerve. They may be repeated at either a slow or a rapid rate. If it is desired to render them "light," "medium," or "strong," the variation is produced by the distal phalanx of one or more fingers with or without pressure from the elbow-joint. "Pressure frictions," on the other hand, are administered in the same manner as pressure vibrations, frictions being substituted for the vibrations.

(B) Running Nerve Frictions.

May be administered with the distal phalanges of two or more fingers, or else with the tips of the forefinger and thumb placed in apposition. The method is the same as for stationary nerve frictions; but the fingers, instead of repeating the friction at the same point of a nerve, are moved either up or down the nerve trunk, so that the frictions take place at different points of its course. Such running nerve frictions may be repeated at either a slow or a rapid rate; and, according to the amount of pressure applied, they are termed "light," "medium," or "strong."

(B) Complex Forms.

(1) *Friction vibrations.*—While either medium or strong up and down vibrations are administered the fingers are simultaneously used to execute small frictions. This manipulation is used on the head, and also at the margins of ulcers in order to stimulate the cutaneous nerves.

(2) *Friction vibrations with suction.*—These are executed in the same manner, suction vibrations being substituted for ordinary vibrations. They are used in the treatment of discharging abscesses, &c.

Whether a stationary or a running friction, or a stationary or a running vibration be administered on a nerve, the nerve is set into vibration. I venture to propound the following as the possible explanation from a physical point of view of the different physiological effects resulting from different methods of nerve treatment :—

A friction across a nerve causes torsional, transverse, and, to a less extent, longitudinal vibrations in it. A running vibration or friction along a nerve causes longitudinal and, to a less extent, transverse vibrations in it. Vibrations given continuously on the same spot on a nerve cause transverse and, to a slight extent, longitudinal vibrations in it. From the very nature of all these manipulations the venous and lymph return in and around the nerves will be promoted. It has also been established by experiment that certain kinds of vibrations stimulate nerves if administered with sufficient intensity.[1]

The precise effect of vibrations and frictions on nerves will be considered on pp. 149, &c.

(B) Frictions on other Structures.

The *modus operandi* of these will be discussed on pp. 194, &c.

For purposes of convenient description the shakings, vibrations, and frictions will be divided into three groups :—

I.—Vibrations and Frictions on Nerves and Ganglia.

II.—Vibrations and Shakings on Other Structures.

III.—Frictions on Other Structures.

I.—Vibrations and Frictions on Nerves and Ganglia.

History and development.—A kind of nerve-pressing was used by P. H. Ling[2] (*cf.* Sondén,[3] Georgii,[4]); he also employed nerve

[1] *See* Langendorff, "Über Tetanisirung von Nerven durch rhythmische Dehnung," in *Centralbl. f. d. Med. Wissensch.*, Feb. 15, 1882, pp. 113-115. Axenfeld, "Vibrationen der Stimmgabel als Nervenreiz," *Centralbl. f. Physiologie*, 1892, vol. vi., pp. 299-300. Uexküll, "Zur Methodik der mechanischen Nervenreizung," *Zeitschr. f. Biologie.*, vol. xxxi., pp. 148-167; "Über Erschütterung und Entlastung der Nerven," *ibid.*, vol. xxxii., pp. 438-445. "Zur Muskel und Nervenphysiologie von Sipunculus Nudus," *ibid.*, vol. xxxiii., pp. 1-27. "Der Neurokinet; ein Beitrag zur Theorie der mechanischen Nervenreizung," *ibid.*, vol. xxxviii., pp. 291-299. Boruttau, "Weitere Erfahrungen über die Beziehung des N. Vagus zur Athmung und Verdauung," *Archiv f. Physiologie*, vol. lxv., p. 26; *also* Schäfer, "A Simple Apparatus for the Mechanical Stimulation of Nerve," in *Journ. of Phys.*, vol. xxvi., pp. xxii., xxiii.

[2] "Gymnastikens Allmänna Grunder," 1834 (1840), p. 71, (1834) 1840, pp. 153, &c.

[3] "Tankar öfver praktisk Medicin," in *Hygeia*, 1840, March No., p. 122.

[4] "Kinetic Jottings," 1880, p. 73.

strokings.[1] Branting, in 1844, referred to phrenic and lumbar nerve pressings as being something new[2]; in 1846 similar manipulations on the spinal accessory and sacral nerves were advocated by him.[3]

A few years later nerve pressings with or without simultaneous trembling movement were used a good deal; sometimes blunt pointed sticks were employed by the operator in the case of deep-seated nerves. The *modus operandi* is described by Rothstein,[4] Neumann,[5] Roth,[6] and Eulenburg,[7] and is referred to in several writings of the latter,[8] as well as in those of Georgii,[9] de Betou,[10] Blundell,[11] Branting,[12] and Hj. Ling.[13] Georgii[14] makes one reference to a "friction plus ou moin légère sur le trajet d'un nerve," and Roth[15] to a "friction along the course of a certain nerve"; but such manipulations are not described by them, and the term is not mentioned by them elsewhere, nor, I believe, in any of the works of the other authors above mentioned. The method with sticks was after a time abandoned as useless, and even the manual nerve pressing became of infrequent use, the benefit obtained being inconsiderable. The enthusiastic Neumann, who in 1852 said, concerning direct nerve treatment:

[1] "Gymnastikens Allmänna Grunder," 1866, pp. 583-584.

[2] Address to the Graduates of the G. C. I., delivered on April 1, 1844.

[3] Address to the Graduates of the G. C. I., delivered on April 1, 1846. *See also* Bock, "Lehrbuch der Pathologischen Anatomie," 1847, p. 572.

[4] "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen, P. H. Ling," 1847, pp. 67, &c.

[5] "Die Heilgymnastik," 1852, pp. 211, &c. "Lehrbuch der Leibesübungen des Menschen," 1856, pt. ii., pp. 265, &c.

[6] "Handbook of the Movement Cure," 1856, pp. 178, &c.

[7] "Die Heilung der chronischen Unterleibsbeschwerden," 1856, pp. 42, &c.

[8] "Mittheilungen aus dem Gebiete der Schwedischen Heilgymnastik," 1854, p. 34.

[9] "Kinésithérapie," 1847, p. 54; "Kinetic Jottings," 1880, pp. 73, 81, 93, 160, 161.

[10] "Therapeutic Manipulation," 1851, p. 11.

[11] "Medicina Mechanica," 1852.

[12] "Address to the Graduates of the G. C. I., April 1, 1844, and April 1, 1846 "Efterlemnade Skrifter," 1882, pp. 178, &c.

[13] "De Första Begreppen af Rörelseläran," 1866; "Förkortad Ofversigt af Allmän Rörelselära," 1880, in which repeated references are made. *See also* his preface to Branting's "Efterlemnade Skrifter," 1882, pp. xxxi., xxxii.

[14] "Kinésithérapie," 1847, p. 54.

[15] "Handbook of the Movement Cure," 1856, p. 6.

"This is a part of the movement cure which up to the present has been least developed by Ling's pupils, although they, especially Branting, quite well recognise the fact that it ought to be one of the most important parts,"[1] in 1856 made the following statement about nerve pressings: "For my part I now consider that these manipulations . . . can quite well be dispensed with, as they can with advantage be entirely replaced by duplicate concentric movements."[2]

Hartelius, at the time when electrical treatment was so much vaunted, combined it with medical gymnastics, but his experience led him to the conclusion that medical gymnastics given alone were productive of greater benefit; he even in some cases found that electricity had the effect of destroying the improvement effected by medical gymnastics. So electricity was not used any longer, and nerve pressing also fell into disuse. In the whole of Hartelius's "Lärobok i Sjukgymnastik"[3] the only descriptions of nerve manipulations are those of arm and leg nerve pressing, to which hardly twenty lines are allotted; as regards other nerves, a few of them (trigeminal, facial, vagus, phrenic, intercostal, great sciatic)[4] are casually referred to.

Meanwhile, however, Henrik Kellgren, in the early days of his practice (*circa* 1865-1868) elaborated his own methods of friction and vibration for the purpose of directly stimulating and soothing nerves, and in the late sixties he was using the new methods with great success. Gradually, in the course of years, many medical men came to hear of them, but reliable information was disseminated slowly owing to the fact that Kellgren himself refrained from publishing any details, and those of the profession who were interested lacked the practical knowledge and technique, without which it was impossible to write any accurate accounts. Amongst those who referred to the subject may be mentioned Drs. Wretlind and Glatter. The former, himself a graduate of the G. C. I., spoke in 1873 of Kellgren's nerve treatment as

[1] "Die Heilgymnastik," 1852, p. 359 (translated).

[2] "Lehrbuch der Leibesübungen," 1856, pt. ii., pp. 265, 266 (translated).

[3] 1st Edition, 1870, pp. 88 & 89. 2nd Edition, 1883, pp. 90 & 91. 3rd Edition, 1892, pp. 88 & 89.

[4] *See also* Hartelius, "De Fysiska Lifsyttringarna hos Menniskan," 1868, pp. 120, &c.; "Om Sjukgymnastiska Rörelsers Verkan och Användning," in *Tidskrift i Gymnastik*, vol. ii., 1890, pp. 201, 202.

something new.[1] Glatter, writing in 1875, refers to Kellgren's nerve treatment as applicable to pneumonia.[2]

In February, 1888, Prof. von Nussbaum, at a lecture given by him, said (translated):[3] "At the present moment very great attention is being awakened at a 'Kuranstalt,' where Kellgren in various nerve diseases selects the affected nerves and gives passive movements called nerve vibrations, thereby obtaining results which are so striking that the scientific world cannot but take notice of them. These nerve vibrations are, beyond doubt, a new and great cure for nervous diseases."

In 1888 Arvid Kellgren, during his course of sixteen demonstrations given at Pola in the winter of 1888-1889, gave the first detailed account of some of his brother's nerve frictions and vibrations. It was published in "Vorträge über Massage," 1888,[4] and his "Technic of Ling's System of Manual Treatment," 1890.

In the winter of 1886-7 Dr. A. Levin of the G. C. I. visited Henrik Kellgren and returned to Stockholm with a certain amount of theoretical and practical knowledge of Kellgren's nerve treatment.[5] His return to that city was promptly followed by a communication at a meeting of the Stockholm Gymnastic Association from A. Wide on nerve pressing[6] and a paper[7] developing his views. Wide had never before published anything concerning this branch of the subject, but now emphasised the importance of the new manipulations.

In his paper "Om Nervtryckning," and in "Handbok i Medicinsk Gymnastik," 1896[8] and "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902-3,[9] Wide gives a list of the nerves most commonly pressed. In "Handbook of Medical Gymnastics," 1899, and "Handbook of Medical and Orthopædic Gymnastics," 1903, which are somewhat abridged, this list is omitted, showing that, after all, Wide must assign to these manipulations a very unimportant position.

[1] "Bref från Dr. Wretlind," in *Hygeia*, 1873, March No., pp. 142, &c.

[2] "Allgemeine Betrachtungen über den Werth der Heilgymnastik," in *Wiener Medicinische Presse*, 1875, Nos. 8, 9, 11, 13, 14, 15, 18, 21, 23.

[3] The lecture has been reproduced as "Neue Heilmittel für Kranke Nerven."

[4] "Statistischer Sanitätsbericht...fur 1888," pp. 163, &c.

[5] *See* "Om Massage vid Blindtarmsinflammation," in *Tidskrift i Gymnastik*, 1883, pp. 687, &c.

[6] *Tidskrift i Gymnastik*, 1887, pp. 594, &c.

[7] "Om Nervtryckning," in *Nordiskt Medicinskt Archiv*, 1887, vol. xix., No. 10.

[8] Pp. 279-284.

[9] Pp. 237-240.

Wide's nerve pressings of the present day are on new principles, and differ radically from the nerve pressings of the Ling school as administered formerly, and from Kellgren's nerve treatment, as can readily be seen from the following extracts from "Handbook of Medical and Orthopædic Gymnastics," 1903.

"The gymnast puts both his hands at once round the extremity, exercising nerve-pressing in such a way that the somewhat separated and bent finger-tips make the pressing while a slight tremble-shaking is also given. As the gymnast repeats this pressing several times, each point of the nerve is met by it, and the movement will thus be a nerve pressing, but still more a kind of muscle kneading. The movement is very agreeable to the patient, but unnecessarily tiring to the gymnast, so that in most cases it should be replaced by muscle kneading."

"Nerve-pressing can either be one quickly passing as when one snaps a string, which is often repeated, or continual for minutes or hours."[2]

Wide also makes an attempt to describe nerve frictions on the head, but says:

"Nerve frictions, performed on other parts of the body, are as agreeable as head-nerve-friction, and certainly possess a stimulating influence, but as the therapeutic value is not yet satisfactorily explained, I shall not class nerve-frictions on the extremities and trunk as special forms of movement. Ordinary nerve-massage and nerve-pressings could easily replace nerve-frictions."[3] (No details are given of any method of actually performing nerve-massage.)

Physiological Effects of Nerve Vibrations and Frictions.

As far as I am aware no experimental work has been done in connection with the above, although many observers have studied the effects of nerve elongation and nerve compressing. The ensuing account of the physiological effects of nerve vibrations and frictions is therefore based on clinical evidence only. The following will be considered in detail:—

(*a*) Effects produced by a stationary vibration on a nerve given

[1] P. 68; *see also* "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 57.
[2] P. 72; *see also* "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 62.
[3] P. 81.

with medium strength from the wrist and finger-joints continuously for the space of a few minutes.

(*b*) Effects produced by stationary friction across a nerve given with a medium amount of strength and repeated for a varying amount of time from a few seconds up to a minute.

As regards the other groups of manipulations it is very difficult to trace clearly their different effects as these vary greatly with different patients, according to their degree of nervous excitability, the nature of their malady, &c.; each set of manipulations can be modified at will so that its effects coincide with those of another set which has also been modified. Thus the effects produced by the above two methods respectively, which are at their extremes diametrically opposite, can theoretically be united by an infinite number of intermediate stages.

(*a*) EFFECTS OF NERVE VIBRATIONS.

(1) Removal of hyperexcitability of nerves.

(2) Diminution of any pain if originally present.

(3) Removal, either partial or complete, of the signs and symptoms of neuritis or neuralgia (if present), and removal of lymph and venous stasis (if present) in the neighbourhood of the nerve, without, however, causing any paralysis of sensation.

(4) Decrease of temperature (sometimes).

In other words the effects are sedative and analgæsic.

(*b*) EFFECTS OF NERVE FRICTIONS.

I.—*Direct Effects.*

(1) *Raising of the nerve functionability (considerable).*—In consequence of the vibrations set up by the friction being transmitted both peripherally and distally from the point of application, the nerve is stimulated not merely locally, but also in a greater part of its length.

(2) *Sensory effects.*—The moment a friction is applied to a healthy sensory nerve a sensation of pain arises in it at the point of application, also shooting down its ramifications; this, however, disappears in a very few seconds. The sensation in question is very similar to that induced by electrical stimulation. A friction of the same intensity on an irritated or painful nerve

causes a temporary increase of the pain already present, followed by a greater diminution.

(3) *Motor Effects.*—Frictions on a motor nerve cause increase in the tonicity of the muscles supplied by it. Sometimes actual contraction occurs; this is generally seen to advantage in spastic conditions. In the case of cramp or spasm of muscles a friction on the nerve supplying them will cause a temporary increase in the cramp or spasm, usually followed by a greater diminution.

(4) *Secretory effects.*—Increase in the amount of perspiration (either general or local) is the usual result of nerve frictions, although in certain cases (*e.g.*, phthisis) diminution is the consequence.

(5) *Sympathetic-motor and vaso-motor effects.*—These can sometimes be obtained directly, but are usually reflex. See p. 152.

II.—*Reflex Effects.*

The subject of reflex effects inducible by nerve friction is very extensive, and not yet fully investigated; it will therefore, be only briefly dealt with.

(1) *Muscles.*—Reflex contraction of muscles results sometimes from frictions given on sensory nerves, whether cutaneous or deeper lying. Even when no visible contraction takes place there is still a tendency towards stimulation of the muscles. Through irritation of the skin the metabolism of the muscles, even when no visible contractions appear, is most markedly increased. In consequence of the centripetal sensory stimulation the muscles are urged by the spinal cord to increased metabolism; there is greater production of carbonic acid and warmth (J. Munk.[1])

The paths travelled by the reflex during the foregoing phenomena of contraction of muscles are very different. The following are some examples taken from my practice:—

(*a*) Sensory nerve to spine, lateral half of one spinal segment, motor nerve to muscle. Examples: the ordinary skin reflexes. In one case of hemiplegia I observed that a friction over the radial nerve at the second metacarpal bone caused a greater amount of involuntary extension of the wrist and fingers than could be effected voluntarily. In one case of commencing spastic

[1] "Physiologie des Menschen und der Säugethiere," 1897, p. 426, translated.

paraplegia a single friction on the long saphenous nerve caused involuntary coarse twitchings of the muscles of the thigh of the same leg; these persisted for nearly a minute.

(*b*) Sensory nerve to spine, down spinal cord of the same side, motor nerve to muscle. Example: In some cases of hemiplegia a friction given on the sensory division of a spinal nerve in the cervical region of the affected side will call forth twitchings of the muscles of the leg of that side. This may also be seen, only to a lesser extent, in some normal persons.

(*c*) Sensory nerve to spine, across the spinal cord to the corresponding segment on the opposite side, motor nerve to muscle. I have only been able to observe one case in which this took place, *i.e.*, a hemiplegia, when frictions on the posterior divisions of the cervical nerves on the unaffected side caused twitchings in the (affected) arm of the opposite side.

(*d*) Sensory nerve to spine, across to and down spinal cord of the opposite side, motor nerve to muscle. Example: In the cases mentioned under (*b*) frictions on the corresponding nerve of the healthy side sometimes produce the same phenomena, only to a less extent.

(*e*) Sensory nerve to spine, up the spinal cord of the same side, motor nerve to muscle. Example: In sclerosed conditions of the crossed pyramidal tracts, a friction given on the internal plantar nerve with a moderate amount of energy will, after a latent period of about half a second's duration, cause involuntary extension of the toes; if given more energetically, involuntary flexion of the hip occurs, accompanied, if the patient be in half-lying position, by passive flexion of the knee-joint. (Arvid Kellgren mentions this in "Technic of Ling's System of Manual Treatment," 1890, p. 54.) This phenomenon, which I will term Kellgren's plantar sign, no doubt results through the same channel as Babinsky's plantar sign, and the two are nearly always found together. In some cases, however, where there is no doubt as to the case being organic and not functional, Kellgren's sign may be present, but not Babinsky's.

(*f*) Sensory nerve to spine, up spinal cord of same side, across to spinal cord of opposite side, motor nerve to muscle. Example: In the case referred to under (*e*) similar involuntary movements of the opposite thigh took place when an energetic plantar nerve friction was being administered. This I will term Kellgren's crossed plantar sign.

(*g*) Sensory nerve to spine, up and down spinal cord of same side, across to and up and down spinal cord of the opposite side, motor nerve to muscle. In a few cases of very excitable nervous system, an energetic friction on any large nerve-trunk may cause general twitchings of the whole body.

From the above it must be admitted that in some cases it is possible through nerve frictions to stimulate the spinal cord to conduction transversely and longitudinally both upwards and downwards; there exists consequently a direct means of exciting the sensory columns, the internuncial fibres and the anterior horns of the grey matter of the cord.

(2) *Blood-vascular system.*—That a moderate stimulation of sensory nerves brings about cardio-acceleration and vaso-constriction, a strong one cardio-retardation and vaso-dilatation, is the (generally accepted) result of electrical stimulation, although the same consequences do not always follow from mechanical irritation.[1]

Stimulation of sensory nerves of the skin causes vaso-constriction thereof if executed lightly, but the reverse if executed energetically.

Frictions on sympathetic ganglia or nerves or on the cerebro-spinal nerves in physiological communication with them generally cause contraction of the blood-vessels supplied by these nerves, with compensatory dilatation of the arteries in other parts of the body (see p. 161). The latter sometimes gives way immediately afterwards to vaso-dilatation which is again followed by a vaso-constriction, and so on; a series of waves is set up, causing alternate decrease and increase in the size of the arteries. The final result may be either a return to the original condition, a vaso-dilatation, or a vaso-constriction, depending on the frequency and intensity with which the frictions are administered, and on the nature of the malady under treatment.

(3) *Sensation.*—Various reflex sensations can be induced; some of these will be referred to under the individual nerves themselves. The sensation induced by stimulation of sympa-

[1] *See* Tigerstedt, "Lehrbuch der Physiologie des Kreislaufes," 1893, pp. 282, &c.; "Lehrbuch der Physiologie des Menschen," 1893, p. 211. Hill, "The Mechanism of the Circulation of the Blood," in Schäfer's "Textbook of Physiology," vol. ii., 1900, pp. 58, &c. Hunt, quoted, p. 156. Kleen, "Über den Einfluss mechanischer Muskel und Hautreizung auf den arteriellen Blutdruck beim Kaninchen," in *Skand. Archiv f. Phys.*, vol. i., 1889, pp. 247, &c., and in *Nordiskt Medicinskt Archiv*, 1888, vol. xx., No. 10.

thetic nerves or ganglia themselves is different from that induced by frictions on cerebro-spinal nerves.

(4) *Internal organs.*—Frictions on some sensory nerves of the skin cause an increase in the depth of respiration. Frictions on sympathethic ganglia or nerves or on the cerebro-spinal nerves in physiological communication with them can, probably through the same segment of the spinal cord, reflexly stimulate internal organs. Actual contraction of the muscular fibres of such organs in some cases manifests itself.

(5) *Glands.*—Frictions on the nerves that lie over glands or that are in physiological communication with the secreto-motor nerves of the latter, as a general rule cause an increase in the secretion from those glands. Sometimes, however, secreto-inhibitory effects are obtained.[1]

(6) *Pupils.*—Reflex dilatation of the pupils can be brought about by frictions on many nerves, both cerebro-spinal and sympathetic (*e.g.*, subtrapezial plexus). Generally, a series of waves of alternating contraction and dilatation is set up, these continuing for from a few seconds to a minute or even longer. In the case of direct manipulation of sympathetic nerves, there is usually a latent period of from a half to three seconds' duration.

(7) *Pyretic conditions.*—Nerve frictions given to patients with pyrexia cause decrease in the temperature. The physiological explanation of this is not obvious.

(8) *Conditions of lowered vitality through inflammation, trauma, &c.*—It would be interesting to determine whether or not frictions over the nerves leading to or from an inflamed or otherwise pathologically damaged area bring about an increased tendency to repair, by improving the local circulatory reaction, which as is known is due in great part to the central reflex mechanism (although it can occur when the vessels are cut off from the nervous system).

Some Other Points in the Physiological Effects of Nerve Frictions.

Summation of inadequate stimuli.[2]—In many cases it can be demonstrated that, whereas one nerve friction is insufficient to

[1] This, for example, has been shown electrically in the case of the great sciatic nerve and pancreatic secretion. *See* Edkins in Schäfer's "Textbook of Physiology," vol. i., 1898, p. 548.

[2] *Cf.* Wündt, "Untersuchungen zur Mekanik der Nerven," &c., 1871, vol. i., p. 198.

produce a desired result, this result may yet be obtained through a series of frictions given, as far as it is possible to judge, with the same intensity and at the same spot.

Summation of adequate stimuli.—In cases of hemiplegia this can frequently be demonstrated as follows:—One friction on the posterior interosseous nerve of the affected arm produces only slight twitchings in the paretic extensors, whereas a series of frictions in rapid succession, given, as far as it is possible to judge, with the same intensity and at the same spot, produces strong contraction in them.

Simultaneous stimulation of a nerve trunk at two points of its course remote from one another.—This produces an extra effect just like electrical irritation similarly applied. Example: In cases of atrophic paralysis of a leg, &c., frictions may be administered simultaneously on the internal plantar and great sciatic nerves of the same side.

Simultaneous stimulation of several nerve trunks.—This may be resorted to in order to obtain a great additional effect.

Do all points of the same nerve respond equally to the same stimulus?—This is a question of considerable interest, which, however, I cannot definitely answer. Observers on sudden nerve compression by means of tetanomotors or similar apparatus are at variance on the subject, as are also those who have experimented with electrical stimuli. (Hallstèn in 1875,[1] Tigerstedt,[2] Hallstèn in 1881,[3] Efron,[4] Beck,[5] Weiss,[6] Munk and Schultz,[7] Eikhoff.[8])

[1] "Studier i Väfnadselementens Physiologie. Irritabiliteten på olika ställen af samma Nerv," in *Finska Läkaresällskapets Handlingar*, 1875, pt. 2.

[2] "Studien über mechanische Nervenreizung," 1880.

[3] "Zur Kenntniss der mechanischen Reizung der Nerven," *Archiv für Anat. u. Phys., Physiol. Abtheilung*, 1881, pp. 90-104.

[4] "Beiträge zur Allgemeine Nervenphysiologie," in *Archiv f. d. ges. Phys.*, 1885, vol. xxxvi., pp. 467-517.

[5] "Die Erregbarkeit verschiedene Stellen desselben Nerven," in *Arch. f. Anat. u. Phys., Physiol. Abtheil.*, 1897, pp. 415-425; and "Zur Untersuchungen der Erregbarkeit der Nerven," in *Archiv f. d. ges. Physiol.*, 1898, vol. lxxii., pp. 352-359.

[6] "Untersuchungen über die Erregbarkeit einen Nerven an verschiedenen Stellen seines Verlaufes," in *Archiv f. d. ges. Phys.*, 1898, vol. lxxii., pp. 15-50; "Neue Untersuchungen über die Erregbarkeit eines Nerven an verschiedenen Stellen seines Verlaufes," *ibid.*, 1899, vol. lxxv., pp. 265-302. The latter contains a list of the literature on the subject.

[7] "Die Reizbarkeit des Nerven an verschiedenen Stellen seines Verlaufes," *Archiv f. Anat. und Phys., Physiol. Abtheil.*, 1898, pp. 297-316.

[8] "Über die Erregbarkeit der motorischen Nerven an verschiedenen Stellen ihres Verlaufes," *Arch. f. d. ges. Phys.*, 1899, vol. lxxvii., pp. 156-195.

Nerve Frictions and Vibrations v. *Nerve Pressings.*

From their very nature there can be no possibility of frictions and vibrations causing any damage to the nerves or paralysing them. The stronger a friction is administered the more marked are the resulting phenomena, and a vibration over a painful nerve will, even if it entirely removes the pain, not cause any paralysis of ordinary sensation after the manipulation is over. As Gotch [1] says, "The methods of Uexküll (*i.e.*, nerve vibration by the 'nerve-shaker,' see p. 144), or modifications of these, are likely to be of great service in the future, as their employment is not accompanied by nerve injury."

I have in some cases of nervous disease tried the effect of both nerve friction and nerve pressing. Although sometimes I have found a muscular response to the former, but not to the latter, I have never found the reverse, and in every case the response has been greater when administering a friction than when applying a pressing.

On the other hand, the law that "a slight pressure stimulates a nerve, a stronger one induces pain, and a still stronger one paralyses it," has been known to Swedish gymnasts ever since the days of P. H. Ling.[2] Even a pressure of medium strength, if kept up for some length of time, will cause a certain amount of paralysis, and cannot do otherwise than bring about venous and lymphatic stasis in the nerve itself, and the tissues immediately surrounding it. A long-continued pressure repeated daily can only result in permanent damage.

Differences between the results obtained from stimulating a nerve by electricity and friction respectively.—This is a matter which (as far as I know) has up to the present received no experimental attention. Not having had the opportunity of investigating the subject myself, I shall only give the following examples taken from clinical observation:—

(1) In some cases of paralysis a motor effect can be obtained from a friction, but not from electrical stimulation.

(2) The effects of a friction endure for some time after the manipulation is over; the effects of electric irritation do not.

[1] *Vide* Schäfer's "Textbook of Physiology," vol. ii., 1900, p. 468.

[2] "Gymnastikens Allmanna Grunder," 1834 (1840), p. 71; *see also* Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, p. 106; "Förkortad Öfversigt af Allman Rörelselära," 1880, pp. 53, &c.

Some of the chief differences[1] between the results obtained respectively from other forms of mechanical excitation and from electric stimulation of a nerve may conveniently be referred to here :—

(1) Continued compression of a nerve produces paralytic symptoms in the nerve trunk itself; continued electric excitation does not.

(2) Regarding the heart and blood-vessels, Asp[2] found that mechanical stimulation of the sciatic plexus of a dog caused cardio-retardation, an electrical one cardio-acceleration. Hunt[3] found that kneading of the muscles of a leg from which the skin had been removed caused a fall of blood pressure, while electrical stimulation always caused a rise in the same.

(3) The diminution in the excitability of a nerve in the kathelectrotonic area after opening a constant current is much less evident in the case of mechanical than in that of electrical stimulation (Tigerstedt[4]).

(4) The only change in a nerve after mechanical stimulation is a slight one in its elasticity, which, moreover, soon passes off (Tigerstedt[5]).

(5) Slow rhythmical vibrations of a rate considerably less than 30 per second with Uexküll's apparatus (see pp. 144, 155), induce tetanus in muscle as well as secondary contractions; the latter, however, do not fuse. This result differs from that obtained from electrical stimulation (Uexküll[6]).

Detailed Consideration of the Individual Nerves and Ganglia.

The sites mentioned in connection with the finding of individual nerves, &c., have special reference to the most conveniently

[1] That differences do exist was known to the Ling school at least as long ago as 1866. *See* Hj. Ling, "De Första Begreppen af Rörelselaran," 1866, pp. 64 and 96; "Förkortad Öfversigt af Allman Rörelselara," 1880, p. 38.

[2] "Beobachtungen über Gefässnerven," in *Berichte der Sächs. Gesellschaft der Wissenschaft, Math-phys. Classe*, 1867, pp. 165, &c.

[3] "The Fall of Blood Pressure resulting from the Stimulation of Afferent Nerves," in *Journal of Physiology*, 1895, vol. xviii., pp. 381-410.

[4] "Die durch einen constanten Strom in den Nerven hervorgerufenen Veranderungen der Erregbarkeit mittels mechanischer Reizung untersucht," in *Mittheil. an der physiol. Labor. des Car. Med.-Chir. Inst.*, 1882, pt. 1.

[5] "Studien über Mechanische Nervenreizung," 1880, p. 48.

[6] "Der Neurokinet; ein Beitrag zur Theorie der mechanischen Nervenreizung," in *Zeitschrift für Biologie.*, vol. xxxviii., pp. 291-299.

accessible points for applying the frictions and vibrations. In the majority of cases I have described merely frictions on nerves, but the sites mentioned are the same for giving a stationary vibration.

(A) Nerves of the Head and Neck.

(1) *Great occipital nerve* is found as it emerges through the trapezius muscle and runs upwards and outwards in the scalp.

There must be some very intimate connection between this nerve, although spinal in origin, and the brain, as it so often happens that morbid conditions of the latter are associated with great tenderness in the former. In some cases the tenderness of this nerve is more marked than that of many of the other nerves of the scalp, which are cranial, not spinal, in origin.

(2) *Small occipital nerve* and

(3) *Posterior auricular nerve* are found as they run over the mastoid process.

(4) *Supraorbital nerve* is found at the notch or foramen of that name, and in its course in the scalp. In some cases there appears to be a physiological continuity between this nerve and the eyeball itself, and the same may be said of some of the other nerves of the orbit and the eyeball. In one case of retinitis pigmentosa and one case of optic atrophy after retrobulbar hæmorrhage that I treated, there was greatly impaired sensation in the nerve; in two cases of exophthalmic goitre, great hyperæsthesia. In one patient suffering from convergent strabismus I noticed that frictions on the supraorbital nerve corrected it for a second or two, the divergence was then re-established, and could be again corrected. In the course of about six weeks permanent improvement resulted. I may add that the patient was under treatment for an old poliomyelitis anterior acuta in the lumbar region of the cord.

(5) *Supratrochlear* and *infratrochlear nerves* are found at the inner side of the orbit.

(6) *Nasal nerve* is found as it passes over the lower edge of the nasal bone. Sensation in this nerve is usually diminished in the case of atrophic conditions of the nasal mucous membrane; the reverse obtains in the case of hypertrophic conditions. In normal persons frictions on this nerve will frequently induce sneezing.

(7) *Nerves of the eyeball itself and the eyelids* are found as follows :—

(*a*) The patient's eyelids having been closed, the tip of the forefinger is placed just internal to the vertical diameter of the eye. Light frictions applied here produce a peculiar sensation in the eyeball, and sometimes also in the frontal region. That the seat of this sensation is chiefly in the eyeball itself is shown by the fact that if the patient be asked to turn his eyes to one or the other side while the frictions are being applied, the peculiar sensation is greatly diminished, the loss not being made good until the cornea again lies under the forefinger. (*b*) There is a certain spot situated in the coronal suture over the site of the motor area for movements of the head and eyes. Frictions given on it often cause a peculiar sensation as of pressure in the eyeball; unless the point be found exactly, no such feeling results. This spot does not lie in the main trunk of the supraorbital nerve; moreover, the sensations induced by friction on the former do not resemble those evoked by frictions on the latter. (*c*) There is another spot on the scalp where a similar sensation can be obtained. It is situated in or near the line of the occipito-parietal suture at about the level of the occipital protuberance.

The muscular fibres of the pupil can be affected reflexly through many nerves (see p. 153).

(8) *Lachrymal nerve.*—A branch (most probably from this nerve) is found where it passes round the outer edge of the orbit, just at the outer canthus.

The lachrymal gland can be reflexly affected through most of the sensory nerves of the face, which come from the fifth cranial nerve.

(9) *Facial nerve* is found as it comes around the ascending ramus of the lower jaw; it can, as a general rule, be quite easily felt. Filaments can also be felt over the zygoma. A peculiar sensation in the face, and sometimes in the pharynx and ear, results from frictions on the main trunk.

(10) *Sensory branches of the fifth nerve that lie in the masseter.*—Frictions on these will often in a few minutes, or even seconds, cure neuralgic toothache.

(11) *Infraorbital nerve* is found as it passes out of the foramen of that name.

(12) *Mental nerve* is found as it emerges from the mental foramen vertically below the supraorbital notch.

(13) *Lingual nerve* is found high up internal to the posterior part of the horizontal ramus of the lower jaw.

The submaxillary ganglion can be stimulated by a friction from behind forwards between the gland and the lower jaw, at a point about midway between the angle and the symphysis menti.

(14) *Hypoglossal nerve* and

(15) *Glosso-pharyngeal nerve* are found below and internal to the horizontal ramus of the jaw.

These three nerves just mentioned can all be conveniently stimulated at the same time ; in order to effect this the head must first be passively flexed to the side on which lie the nerves it is desired to manipulate

(16) *Superior laryngeal nerve* is found at the posterior end of the upper border of the thyroid cartilage. Sensation in the larynx, ear, pharynx, and top of the head, sometimes even a sense of constriction round the skull, are felt in many subjects on stimulating this nerve, and a cough is frequently induced.

(17) *Inferior (recurrent) laryngeal nerve* is found at the side of the trachea low down. A sense of constriction in the larynx is usually felt on stimulating this nerve, and a cough often results. In addition a slight feeling of vomiting may be felt ; this is most probably a reflex through the vagus.

On giving a friction on the top of the sternum a sense of constriction in the larynx can be induced similar to that resulting from friction on the inferior laryngeal nerve. The peculiar sensation in question is in some persons felt in the bronchi as well.

(18) *Vagus nerve* is found as it lies under cover of the sterno-mastoid between the internal jugular vein and the internal and common carotid arteries. The sterno-mastoid having been relaxed by bending the head forwards or sideways, the finger is passed either in front of the muscle or behind it (depending on the situation in the neck where it is desired to stimulate), and the frictions given transversely across the nerve.

This manipulation will in some persons produce cardio-retardation[1] ; in others, eructations or even vomiting will result.

(19) *Phrenic nerve* is found low down in the neck behind the clavicular insertion of the sterno-mastoid. Nerve pressings on it

[1] *Cf.* Tigerstedt, "Lehrbuch der Physiologie des Kreislaufes," 1893, pp. 237, &c. ; *also* Waller, "On the Compression of the Vagus Nerve, &c.," in *Practitioner*, December, 1870.

were formerly used by the Ling[1] school to relieve diaphragmatic spasm. In many such cases, owing to the difficulty in finding the nerve, it would be better to resort to subcostal shaking (p. 192), shaking over the bladder (p. 168), and subdiaphragmatic suction (p. 217).

(20) *Spinal accessory nerve* is found as it passes downwards and backwards just behind the sterno-mastoid at about the middle of its posterior border. Often, however, it is most conveniently stimulated through the medium of the subtrapezial plexus (see below).

(21) *Subtrapezial plexus* is found lying in the substance of the trapezius at a point situated in a line drawn directly backwards from the middle of the clavicle. I have noticed in cases of disease of the female pelvic organs where chronic shoulder-ache was an additional distressing symptom, that this pain could be localised to the subtrapezial plexus (sometimes also the suprascapular nerve); in some instances, frictions given on it could relieve the pain. For effect on the pupil, see p. 153.

(22) *Brachial plexus in the neck.*—The primary trunks are found by passing the finger deep into the posterior triangle in front of the trapezius. Frictions on them call forth a kind of dull boring pain which is unlike the sensation resulting from frictions on the brachial plexus in the axilla.

(23) *Cervical spinal nerves.*—The finding of some of the branches of these nerves, *e.g.*, the great occipital, small occipital, &c., has been considered already. In order to administer frictions on the nerve trunks themselves, one hand is placed on the back of the patient's neck so that the tips of the fingers lie on one side and the tip of the thumb on the other, the precise point of application depending upon whether the posterior or the anterior branches of the nerves are to be stimulated. The former are found posteriorly near the middle line as they emerge through the trapezius, the latter are found more externally and anteriorly under cover of and in front of that muscle. The frictions are given from before backwards, and a feeling of cold or warm shivers down the spine usually results; in some subjects the sensation may be continued so as to be felt right down the limbs to the very toes.

[1] *See* Branting's address to the graduates of the G.C.I., on April 1, 1844. Also quoted by Georgii, "Kinésithérapie," 1847, p. 95. *See also* Hj. Ling, "De Första Begreppen af Rörelseläran," 1866, pp. 92, 93, 141.

The second cervical nerves appear to contain the vaso-motor fibres for the head; frictions on them will frequently relieve headaches that are a consequence of hyperæmic or congested states of the brain. Such frictions are particularly useful in cases of fever, because they have not only an antipyretic but also stimulating effect.

Effect of cervical nerve frictions on the spinal cord.—It is very difficult to specify the exact paths along which the stimulus travels, but most probably the following areas in the cord are affected :—

(*a*) Sensory columns.

(*b*) Internuncial fibres.

(*c*) Anterior horns of grey matter.

This is inferred chiefly from clinical study, as follows :—

When the sensory columns are pathologically affected as in cases of tabes dorsalis, no feeling of cold shivers down the spine results from even the most vigorous frictions on the cervical nerves,[1] which tends to show that normally the sensation of cold shivers is propagated along the sensory columns. In one case of disseminated cerebro-spinal sclerosis, where in addition to the motor symptoms there were also sensory phenomena such as diminished sensation, "cotton wool" under the feet, &c. (more marked on the right side), the sensation of cold shivers was only felt to a slight degree and less in the right half of the spine than in the left half. In one case of gunshot wound of the spine at the level of the fifth dorsal vertebra, with ensuing complete motor and sensory paralysis below the site of the lesion, the bodies of the vertebra and ribs, and with them the sympathetic nerves, being, however, uninjured, the cold shivers sensation was felt as far as the fifth dorsal segment and no farther.

In some cases of hemiplegia cervical nerve frictions will cause involuntary twitchings or even coarse movements to take place in the affected arm or leg. [This is sometimes seen to a less extent in normal people (see p. 151).] Cold shivers down the spine are usually felt by such patients.

Effect of frictions on the lower cervical nerves on the sympathetic system. The following phenomena are often observed :—

(*a*) Cutis anserina of the limbs.

[1] This symptom may prove of value in the differential diagnosis of tabes dorsalis and peripheral neuritis.

(*b*) Perspiration over the whole body, specially in nervous patients and in fevers.

(*c*) An effect on the arteries and the heart. As a general rule there is temporary vaso-constriction, which is followed by a certain amount of vaso-dilatation with improved and slowed cardiac action; *e.g.*, in one case of cardiac dilatation, with a markedly dicrotic pulse which beat 150 per minute, the above frictions removed the dicrotism and reduced the pulse rate to 130 per minute, the cardiac action becoming stronger. These frictions administered to a patient who has fainted will often result in recovery immediately after, and sometimes even during the application; the pallor of the face and lips can be seen rapidly to give way to the normal red colour.

(24) *First cervical sympathetic ganglion* is found internal to the sterno-mastoid high up, the patient's head being passively flexed forwards so as to relax those muscles. I have stimulated this ganglion in some cases of eye and middle ear affections.

(25) *Second cervical sympathetic ganglion* is found behind the middle of the sterno-mastoid, the patient's head being as described under (24). I have stimulated this ganglion in some affections of the eye, throat, and tongue.

(26) *Third cervical sympathetic ganglion* is found behind the clavicular insertion of the sterno-mastoid (which must be relaxed as before). Frictions are given on it with the finger passed in behind the muscle specified. In some cases respiration becomes deeper and fuller as a result of the manipulation.

(B) Nerves of the Trunk.

(1) *Intercostal nerves in the thorax* lie under cover of the ribs, which must be elevated in order to better expose them. The patient is consequently placed in stretch grasp or stretch half lying position, and the frictions are then given from before backwards near the lower margin of the upper rib of each intercostal space.

The normal impulse to respiration is largely derived from sensory impressions from the cutaneous nerves which pass into the spinal cord; and frictions on the intercostal nerves, presumably increasing the centripetal stimulation, in many cases improve the respiratory function.

In the abdomen reflex contractions of the muscles of its wall are frequently found as a result of irritative or inflamed conditions of organs in its cavity. The same state of matters obtains with the thorax; reflex contractions of the intercostal muscles result from many morbid conditions of the lungs, bronchi, and pleura. Frictions on the intercostal nerves of the affected spaces appear in some cases to act beneficially on the affected internal part (see pneumonia and pleurisy).

The lateral cutaneous branches of the intercostal nerves are found emerging a little in front of the mid-axillary line, their anterior branches running forwards and their posterior ones backwards.

The anterior cutaneous branches of the upper six intercostal nerves are found as they emerge near the outer edge of the sternum.

(2) *Descending cervical nerves* (from the superficial part of the cervical plexus) are found as they pass over the clavicle down to the mammary gland.

(3) *Spinal nerves of the dorsal, lumbar, and sacral regions.*

(*a*) *Dorsal spinal nerves.*—Their anterior branches (*i.e.* the intercostals) have already been referred to (p. 162). The posterior branches are found as they emerge through the erector muscles of the spine near the middle line, the points of emergence of the lower two or three lying more externally than do those of the others.

(*b*) *Lumbar spinal nerves.*—The posterior branches are found further away from the spine than the corresponding branches of the dorsal nerves, and their points of exit diverge from above downwards, so that the lowest ones are about four inches from the middle line in persons of ordinary size.

(*c*) *Sacral spinal nerves.*—The posterior branches are found as they emerge through the gluteus maximus and erector spinæ, their points of exit converging slightly from above downwards.

All frictions on the posterior sensory divisions of the spinal nerves should be given as much as possible in a direction at right angles to their course, just as in the case of any other nerve, as follows :—

Dorsal, from within upwards and outwards.

Lumbar, from within outwards and slightly upwards.

Sacral, from within outwards.

Effect of frictions on the posterior divisions of the dorsal, lumbar, and sacral spinal nerves.—Probably the same parts of the spinal cord are stimulated as in the case of cervical nerve frictions (see p. 161), though the resulting phenomena are not so marked.

Of great importance, however, are the effects on the following ganglia :—

(4) *Sympathetic ganglia of the thorax and abdomen.*—Each pair of these is in anatomical and physiological communication with the posterior primary divisions of the corresponding spinal nerves by means of the rami communicantes, anterior primary division of the nerves, spinal cord, and recurrent sensory fibres.

Henrik Kellgren in the early days of his practice observed that inflamed or irritative conditions of various internal organs, &c., are in most cases accompanied by tenderness in various spinal nerves, which is specially marked over the sites of the communicating cords to the sympathetic ganglia; moreover, it has been established clinically that frictions over these tender areas can cause amelioration in the morbid conditions of the parts specified.

The following symptoms are found in morbid conditions respectively of—

(*a*) *Lungs and bronchi.*—Tenderness between the scapulæ, no doubt due to the fact that the posterior pulmonary plexus is largely formed from the second to fourth thoracic sympathetic ganglia. I have never failed to find this tenderness with acute bronchitis, chronic bronchitis, and phthisis pulmonum. In addition there is often tenderness in the nerves supplying the intercostal spaces that lie over any affected area (see intercostal nerves, p. 163).

(*b*) *Heart.*—Tenderness in many cases when frictions are given over the fourth and fifth dorsal nerves of the left side.[1]

(*c*) *Liver and gall-bladder.*—Tenderness in many cases when frictions are given below and internal to the inferior angle of the right scapula; the area corresponds to the sixth and seventh dorsal nerves.

(*d*) *Stomach.*—Tenderness in many cases of the sixth, seventh, and eighth dorsal nerves on the left side; frictions on these nerves may cause eructations. In morbid conditions of the pylorus, the same nerves on the right side are often involved.

[1] *Cf.* P. H. Ling, "Gymnastikens Allmanna Grunder," (1834), 1840, p. 171.

(*e*) *Intestines.*—Tenderness of the sixth to eleventh dorsal nerves; no doubt through the greater and lesser splanchnic nerves. The same nerves are tender in general peritonitis (see intercostal nerves in the abdomen, p. 166).

(*f*) *Diaphragm.*—Tenderness on giving frictions over the second (sometimes also the first) lumbar nerves. In the case of a normal person such frictions will often cause him to "catch his breath," although no pain is produced. In one case of diaphragmatic pleurisy that I treated I found great tenderness over the last two dorsal and the first two lumbar nerves.

(*g*) *Spleen.*—Tenderness of the ninth and tenth dorsal nerves on the left side.

(*h*) *Kidneys.*—Tenderness of the tenth, eleventh, and twelfth dorsal nerves; in all probability through the least (also the lesser) splanchnic nerves, which end in the renal plexus.

(*i*) *Genital organs.*—Tenderness in particular of these spots:—

(*α*) Twelfth dorsal nerve.

(*β*) Fifth lumbar nerve.

(*γ*) Second to fourth sacral nerves.

The third sacral nerve is often especially painful in inflammatory conditions or displacements of the uterus.

(*j*) *Rectum.*—Tenderness of the fourth sacral nerve.

(*k*) *Bladder.*—Tenderness of the sacral nerves, more particularly the first and third.

It will be noticed that the affected nerves do not in every case correspond to the tender skin areas of referred pain as determined by Head,[1] and in many cases the tenderness can only be elicited by means of deep pressure, not by merely touching the skin.

How can the amelioration that takes place in morbid conditions of these various organs in consequence of the nerve frictions be explained? It is possible that a condition of matters obtains analogous to that in the case of muscles, stimulation of the sensory nerves over muscles causing increased growth and activity (see p. 150). A vaso-motor element may also be present. The whole subject, however, demands investigation, not merely from a therapeutic, but also from a diagnostic and prognostic point of view.

[1] *See* "On Disturbances of Sensation with Special Reference to the Pain of Visceral Disease," in *Brain*, 1893, pts. lxi. and lxii., pp. 1-132.

(5) *Intercostal nerves in the abdomen* are found by placing the patient in some such position as stretch grasp standing or stretch half lying, whereby the anterior abdominal muscles are made tense, and then administering frictions over each nerve as it becomes cutaneous near the middle line. The frictions should take place from without inwards in a line from above downwards.

There is a close connection between the intercostal nerves in the abdomen and viscera of that cavity through the medium of the lower thoracic ganglia from which the splanchnic nerves are derived (see p. 163).

(6) *Ilio-hypogastric nerve* and

(7) *Ilio-inguinal nerve* are found running forwards near the crest of the ilium. The latter can also be found in the inguinal canal, where frictions made transversely across it will greatly relieve the agonising, sickening pains arising from contusions of the testicle.

The intimate connection existing between the abdominal viscera and the intercostal nerves (see above) seems also to exist between the former and the ilio-hypogastric and ilio-inguinal nerves.

(8) *Ganglion impar* is found, when the patient has conveniently been placed in side lying or forwards lying position, by passing the last phalanx of the forefinger on to the anterior surface of the tip of the coccyx. The frictions are made from above downwards. The patient in many cases experiences a kind of lightning pain through the abdomen, with a desire to defæcate and a sensation of fulness in the head and neck ; sometimes his face can even be seen to flush. These consequences show that the sympathetic nerves of the abdomen have been stimulated with intestino-motor and vaso-constrictor effect, and compensatory dilatation of the vessels in the more distant parts ensues in consequence.

Some patients, during the administration of frictions on the ganglion impar, experience a "cold shivers" sensation, similar to that induced by cervical nerve frictions, proceeding from below upwards. Others have told me that they felt a sharp pain at the umbilicus.

I have noticed that in some cases of habitual constipation this ganglion has given no sensation at all on stimulation, and sensation at this point only returned gradually as the consti-

pation improved. This absence or diminution of sensation is also found in patients suffering from locomotor ataxia and paralysis agitans.

(9) *Coccygeal nerve* is found when frictions are given transversely across the posterior aspect of the coccyx. The effects are somewhat similar to those resulting from frictions on the ganglion impar; the desire to defæcate usually results, although the vaso-motor phenomena are absent.

(10) *In the anterior wall of the rectum* there is often great susceptibility at a point about one and a half inches from the anus. When other frictions on the ganglion impar, sacral nerves, &c., have failed for the time being in bringing on a rectal evacuation, a friction from above downwards over this spot will often succeed in so doing.

(11) *Renal plexus* is found by stimulating the tenth, eleventh, and twelfth dorsal nerves as described on p. 165, also by placing the patient in half lying position and proceeding as follows: The assistant places his fingers on the patient's abdomen at a point about three inches above and three inches external to the umbilicus (in persons of average size); the patient then breathes freely, and with each expiration the assistant passes his fingers further and further down until they lie deep enough. They must not be thrust in suddenly, as that would bring about reflex contraction of the abdominal muscles, which would at once prevent their advancing. (This method of getting deep into the abdomen is to be followed out in all cases when it is desired to stimulate structures that lie far back). The frictions are given from without inwards, and both renal plexus and kidney are stimulated simultaneously.

Instead of the fingers, the thumb may be used; and in cases of unusual tendency towards reflex contraction of the abdominal muscles the patient may be placed in crook half lying position, when those muscles are more effectively relaxed than is possible when the knees are kept extended.

(12) *Solar plexus* is found when the fingers are pressed in deeply about two inches below the xiphoid cartilage. The frictions are made transversely across it, and stimulation of the abdominal sympathetic as a whole is often the result. Similar effects can, however, be obtained by:—

(*a*) Making frictions on the umbilicus itself, in which case

pain is felt passing up to the sternum, downwards into the point of the penis and generally speaking radiating in all directions in the abdomen.

(*b*) Shaking the pit of the stomach (see p. 192).

In the case of the gunshot wound of the spine referred to on p. 161, sensation was normal over the solar plexus; nowhere else in the abdomen, however, could either superficial or deep frictions elicit any sensation whatever.

(13) *Sympathetic nerves over the bladder* are affected by vibrations or shakings in an upward direction just over the symphysis pubis about an inch from the middle line (fig. 71). This often leads to an immediate desire on the part of the patient for micturition; in some cases a rush of blood to the head also ensues.

Henrik Kellgren has found that vibrating or shaking over the bladder has the extraordinary effect of relieving cough and rendering respiration freer. I have had abundant opportunity of observing this myself in diseases of the respiratory apparatus, more especially acute and chronic bronchitis, emphysema and phthisis of the lungs, and also in some cases of stammering, as follows:—

Miss S. J., aged 16, came to me on August 14, 1900, with the complaint that she stammered. This defect was the sequence to a fright suffered some nine years earlier, and had gradually developed since that occasion. Before effecting the pronunciation of a word and then again before each following word, came the syllable "tut" repeated from five to fifteen times; when she became excited it took her sometimes as much as a minute to utter a clear articulation. In particular I found rapid spasmodic action of the diaphragm when she tried to speak, and a great tenderness over the bladder when I gave shakings over it; the abdominal muscles just over the symphysis were hard and contracted. (The urine was quite normal). I treated these several parts more particularly; and at the end of six weeks, when the patient left, the muscular contractions were gone, the bladder was less tender, and the diaphragm worked better. When not excited, the patient's speech was perfectly normal. I also noticed that the patient's speech varied with the condition of the bladder; the better the latter the better the former, and *vice versâ*.

I have observed this tenderness over the bladder and contraction of the abdominal muscles in two other persons who stammered, but as I saw the latter only once in consultation and did not treat them, cannot tell whether they would have been cured by the treatment described in connection with the first instance.

There must be some very intimate connection between the sympathetic nerves over the bladder and those of respiration; I am, however, unable to specify the anatomical and physiological channel.

It has been already mentioned that stimulation of the abdominal sympathetic frequently causes vaso-dilatation of the head.

FIG. 71.

This can be prevented in most cases by administering an energetic vibration on the coronal suture; this in some way induces a vaso-constrictor effect[1] (fig. 71).

(14) *Inferior hypogastric plexus* is situated in front of the promontory of the sacrum. The assistant passes his fingers in deeply (as described on p. 167) until they lie over the promontory; the frictions are given transversely.

(15) *Other parts of the abdominal sympathetic* are found deep down near the middle line, and can be stimulated in the same way as the above.

[1] *See* Hartelius, "Lärobok i Sjukgymnastik," 1870, p. 91; 1883, p. 92; 1892, p. 91.

(C) Nerves of the Upper Extremity.

(1) *Anterior thoracic nerves.*—These nerves, which supply the pectoral muscles, are found either by making frictions from the front through these muscles or by passing the finger round the edge of the muscles in an inward direction, and making frictions on their posterior surface.

(2) *Suprascapular nerve* is found as it emerges from the suprascapular foramen, or as it ramifies in the substance of the supra- and infraspinatus muscles (see p. 160).

(3) *Brachial plexus as a whole.*—The method of finding and then giving frictions on this plexus above the clavicle has already been considered (p. 160). In the axilla many of the nerve trunks are to be felt as they lie around the artery; they can be stimulated by means of frictions across them.

(4) *Circumflex nerve* is found either through its lower branch, which is met posteriorly as it emerges from the quadrilateral space and ramifies over the adjacent skin areas, or as it lies under, in, and over the deltoid muscle.

(5) *Musculo-spiral nerve* is found where it lies between the internal and external heads of the triceps, and lower down where it lies between the brachialis anticus and the supinator longus.

(6) *Median nerve* is found:—

(*a*) In the axilla as it lies along the axillary artery.

(*b*) In the upper arm as it runs internal to the biceps muscle.

(*c*) At the elbow as it lies in the anticubital fossa in the middle line.

(*d*) In the forearm as it courses down in the middle line.

(*e*) In the hand through a large branch which lies deeply along the inner side of the first metacarpal bone.

(7) *Ulnar nerve* is found:—

(*a*) In the axilla as it lies to the inner side of the axillary artery.

(*b*) In the upper arm as it lies along the inner border of the biceps.

(*c*) At the elbow as it lies in the groove behind the internal condyle.

(*d*) In the forearm as it runs down its ulnar aspect.

(8) *Posterior interosseous nerve* is best found as it winds round the radius in the substance of the supinator brevis, the forearm

being flexed and somewhat pronated; it can also be stimulated in its course at the back of the forearm.

(9) *Radial nerve* is found where it lies in the upper part of the forearm, along the inner border of the supinator longus. To render the nerve accessible the forearm must be somewhat flexed in order to relax that muscle; while quickly pronating it the frictions are administered on it with the thumb.

One branch may also be found as it lies external to the second metacarpal on the dorsum of the hand (see also p. 150).

(D) Nerves of the Lower Extremity.

(1) *Superior gluteal nerve* is found where it runs along about two inches below the crest of the ilium, and describing the same kind of curve as the latter.

(2) *Inferior gluteal nerve* is found where it runs along the inner side of the buttock.

(3) *Great sciatic nerve* is found either where it lies between the great trochanter and the tuberosity of the ischium, nearer to the latter, or in its course down the middle of the back of the thigh.

(4) *Internal popliteal nerve.*—In order to find this nerve the knee-joint must be flexed to about a right angle in order to relax the popliteal fascia. Frictions can then be given on the nerve as it runs down superficially in the middle of the popliteal space.

(5) *External popliteal nerve* is easily found, with the knee-joint flexed as before, behind the head of the fibula at the inner side of the tendon of the biceps.

(6) *Anterior tibial nerve* is found where it runs between the tibia and the fibula to the outer side of the tibialis anticus; and lower down one of its branches can be followed to the first interspace.

(7) *Posterior tibial nerve* is found in the middle line at the back of the calf. In order to reach it, the fingers of the assistant and the superficial calf muscles must move as one over the nerve. Lower down it is accessible where it lies behind the internal malleolus.

(8) *Internal plantar nerve* is found where it lies to the outer side of the abductor hallucis. Frictions may also be administered on the large branch that goes to supply the first interspace.

The effects of such a friction in spastic conditions have been described on p. 151.

(9) *External plantar nerve* is found where it runs obliquely across the foot from within outwards. In spastic conditions the effects of frictions on it are the same as in the case of the internal plantar nerve, although not so strongly marked.

(10) *Musculo-cutaneous nerve* is found high up as it lies between the peronei muscles, and lower down as it lies cutaneously.

(11) *Anterior crural nerve* is found where it lies between the psoas and iliacus at Poupart's ligament, and also where it divides into its various branches in the upper part of the thigh.

(12) *Long saphenous nerve* being cutaneous in the greater part of its extent is easily found along the inner side of the leg. There seems in some cases to be a physiological connection between this nerve and the ovary of the same side.

(13) *External cutaneous nerve* (from the lumbar plexus) is found where it becomes cutaneous below the anterior superior spine in the upper third of the thigh. This nerve is often tender in affections of the kidney.

(14) *Obturator nerve* is found as it emerges from the thyroid foramen, the thigh being somewhat flexed, abducted and externally rotated, and in its course along the adductor muscles.

(15) *Short saphenous nerve* being cutaneous in the greater part of its length, is easily found on the postero-external aspect of the calf.

(16) *Sensory nerves of the foot, i.e.*, long saphenous, short saphenous, musculo-cutaneous, anterior tibial, internal plantar, external plantar and plantar cutaneous from the posterior tibial are conveniently found and stimulated in groups by administering frictions with the backs of the nails over the skin of the dorsum and sole of the foot.

Exercises comprising the Treatment of Nerves in Regions.

All the following sets of running frictions (or running vibrations) are generally given three times in succession, and should be executed with all possible evenness and continuity. The number of applications may, however, be increased, if the indica-

tions seem in favour of such a proceeding, especially in cases of nerve manipulations of the head.

(1) Head and Face.

The patient assumes the sitting position. The assistant may give running frictions or vibrations as follows :—

(1) In the lines of the superior longitudinal and great lateral sinuses. The cutaneous nerves of the part are stimulated, and cold shivers down the spine are often felt, the sensation being similar to that caused by cervical nerve frictions, although less marked.[1]

(2) Around the side of the skull. The assistant's fingers begin in the middle line anteriorly between the tuberosities of the frontal bone, and pass horizontally backwards until the great occipital nerve is reached, along which they travel downwards and inwards (fig. 88, p. 222). The chief nerves stimulated are —supra-orbital, temporo-facial, temporal branches of the facial, auriculo-temporal, small and great occipital. As in (1) above, the sensations of cold shivers may also be felt.

(3) On the facial or fifth nerves or other individual nerves if they call for special attention (see head exercise, p. 220).

(2) Upper Extremity.

Yard Sitting Arm Running Nerve Frictions, PP.

The assistant having brought the arm which is to be stimulated into yard position, supports it in that position with one hand, using the fingers of his other hand to give the frictions or vibrations. He begins in the axilla over the brachial plexus and proceeds downwards along the inner edge of the biceps, thus reaching the median and ulnar nerves, and then follows the latter nerve round the internal condyle down the front of the forearm, fourth metacarpal and the third finger right to its very tip, where the median and radial nerves are found as well. He then returns *viâ* the back of the third finger and fourth metacarpal (ulnar and radial nerves), the back of the forearm

[1] Georgii and Branting ascribed to this manipulation the effect of constriction of the vessels of the scalp. *See* Branting's address to the graduates of the G. C. I. on April 1, 1842; also quoted by Georgii "Kinésithérapie," 1847, pp. 84 and 85; and "Kinetic Jottings," 1880, p. 192.

(posterior interosseous nerve) on to the musculo-spiral nerve, and along the latter to near the shoulder. Thereupon he passes along the posterior branch of the circumflex nerve to the suprascapular nerve, across the suprascapular fossa and then downwards between the shoulder blade and spinal column over the upper dorsal nerves. The cutaneous nerves in the course of the manipulation are stimulated in addition to the deeper lying trunks.

(3) Lower Extremity.

Half Lying Double Leg Running Nerve Frictions, PP.

Both legs are treated simultaneously, the assistant using one hand for each limb. He begins over the great sciatic nerve high up, and follows it downwards to its termination, going along the internal popliteal, posterior tibial, and internal plantar to the interval between the first and second metatarsals. He then passes on to the dorsum of the foot and travels up to the pelvis along the anterior tibial and external cutaneous nerves. On repeating the frictions, he may return *viâ* the anterior tibial, long saphenous, internal cutaneous and obturator nerves.

The cutaneous nerves in the path of the manipulation are stimulated in addition to the deeper lying trunks.

Side Lying Leg Running Nerve Frictions, PP.

The assistant only treats one leg at a time (the uppermost one), his two hands travelling simultaneously and at the same rate; one of them proceeds along the great sciatic nerve down to the end of the internal plantar nerve (as in the last exercise), the other along the external cutaneous and anterior tibial nerves, finishing up at the termination of the latter in the space between the first and second metatarsals. Then the frictions may be recommenced from above, or the hand last mentioned may first travel back in the reverse direction.

The cutaneous nerves lying in the path of the manipulation are stimulated in addition to the deeper lying trunks.

The cutaneous nerves of the foot have been enumerated on p. 172, they may call for separate treatment, but most of them are stimulated by means of the above exercise.

(4) Cerebro-spinal System as a Whole.

Forwards Lying Head to Foot Running Nerve Frictions, PP.

The assistant gives the same frictions simultaneously on both sides, so the method on only one side will be described. His fingers begin in the middle line internal to the tuberosities of the frontal bone, and pass on round the sides of the skull and down the great occipital nerve (see (2) p. 173) to the posterior sensory branches of the cervical nerves. They then pass over the subtrapezial plexus and suprascapular fossa down the front of the deltoid muscle (anterior division of the circumflex nerve), along the outer edge of the biceps (cutaneous nerves) and back again over the musculo-spiral, posterior division of the circumflex and suprascapular nerves, and from there to the first dorsal nerve. After this they pass down the back near the middle line, giving frictions over the sensory divisions of each spinal nerve, affecting in turn the dorsal, lumbar and upper sacral. (The method of doing the latter has been described on p. 163.) Having reached the third sacral nerve, they pass outwards on to the great sciatic nerve and follow it down the leg, successively giving frictions on the internal popliteal, posterior tibial and internal plantar nerves, and finishing up in the interval between the first and second toes in the sole (fig. 72). The cutaneous nerves in the path of the manipulation are stimulated in addition to the deeper lying trunks.

The effects resulting from this exercise may be greatly intensified by causing the frictions to be administered simultaneously by three assistants. The first assistant will begin as described above; when he is about half way, the second will follow suit; and the third will begin when the second is about half way (by which time the first is just finishing at the internal plantar nerve). As soon as the third is half way the first recommences, and so on, each assistant administering the frictions three times.

Stretch Side Lying Hand to Foot Running Nerve Frictions, PP.

These frictions are usually administered first on one side of the body and then, the patient turning over, on the other. In

some cases of unilateral conditions, such as hemianæsthesia, hemiplegia, &c., only the affected side is treated; but even in

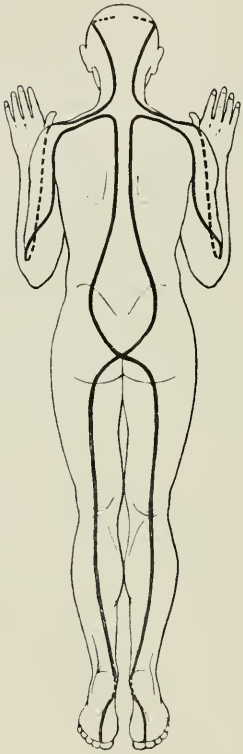

FIG. 72

FIG. 73

such conditions it is often of advantage to include the healthy side as well, because the patient having learnt how the frictions

feel on the healthy side is rendered more capable of recognising them on the affected side; besides which, the cerebro-spinal system is stimulated bilaterally, raising the nervous tone as a whole.

The assistant executes the frictions simultaneously with both hands, which travel at the same rate. The paths travelled by his hands are, however, different, and must be described separately.

One hand begins anteriorly over the third finger of the patient's hand, and travels along the ulnar nerve as it lies in in the hand, forearm, along the inner border of the biceps, and in the axilla. The hand having reached the ribs, a friction is executed over each intercostal nerve in the anterior axillary line, thus stimulating also the anterior branch of each lateral cutaneous nerve. It then passes along the side of the abdomen in the same line, reaching the last dorsal, ilio-hypogastric, ilio-inguinal nerves, &c., from which it travels down the antero-external aspect of the leg, executing frictions on the external cutaneous and anterior tibial nerves, and finally passes along the dorsum of the foot in the path of the nerve last mentioned until the interval between the first and second metatarsals is reached.

The assistant's other hand begins posteriorly over the patient's third finger (ulnar and radial nerves), and having reached the forearm travels along the posterior interosseous, musculo-spiral and circumflex nerves on to the ribs; a friction is executed on each intercostal nerve in the posterior axillary line, the posterior branch of each lateral cutaneous nerve being also stimulated. It then travels along the side of the abdomen in the same line, and passing on to the leg, executes frictions on the sensory nerves of the gluteal region, great sciatic, internal popliteal, posterior tibial and internal plantar nerves, finishing similarly to the other hand, but on the corresponding plantar aspect (fig. 73). The cutaneous nerves in the path of the manipulation are stimulated in addition to the deeper lying trunks.

Stretch Half Lying Hand to Foot Running Nerve Frictions, PP

The same manipulations being executed simultaneously on both sides of the body, it is only necessary to describe the

path traversed by one of the assistant's hands. Beginning over the patient's third finger, a series of running frictions is

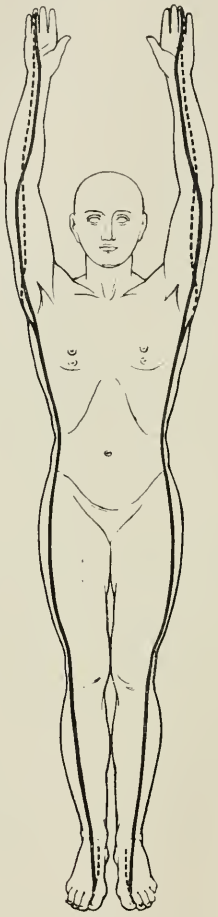

FIG. 74.

administered along it and the fourth metacarpal, forearm and upper arm, with the assistant's thumb on the anterior aspect

and his fingers on the posterior, in turn stimulating anteriorly the ulnar and median nerves, and posteriorly, the radial, ulnar, posterior interosseous, musculo-spiral and circumflex nerves. The thumb and fingers then meet and execute frictions on the intercostal nerves in the mid-axillary line, thereby also stimulating their lateral cutaneous branches around the side of the abdomen in the same line (see above p. 177), the external cutaneous nerve in the thigh, and the anterior tibial nerve as far as the ankle-joint. The thumb follows the last mentioned nerve to its termination between the first and second metatarsals, while the fingers pass on to the sole and follow the internal plantar nerve to its termination on the corresponding plantar aspect (fig. 74). The cutaneous nerves in the path of the manipulation are stimulated in addition to the deeper lying trunks.

In any of the above exercises on the cerebro-spinal system as a whole, frictions may be administered along each intercostal nerve for the greater part of its length. This is effected more easily in the case of the last two exercises than in that of the first one mentioned, because in the initial position the patient's arms are stretched up, and thus the ribs are elevated and the nerves rendered more accessible.

An additional effect can be obtained from the last two exercises by applying traction at the hands and feet while the frictions take place. Three assistants are required to carry out this combination, one to execute the running nerve frictions while the other two apply the traction.

For the sake of brevity I shall omit the qualifying words "hand to foot," "head to foot," and simply term the manipulations "running nerve frictions"; thus "forwards lying running nerve frictions, PP.," &c.

Effects of all the above running nerve frictions :—

(1) Stimulation of the cerebro-spinal system as a whole.

(2) Stimulation of the sympathetic system as a whole, with (usually) vaso-constrictor effect followed by vaso-dilatation and then a return to the normal (see p. 152).

(3) Stimulation of the motor nerves in the path of the manipulation.

(4) Stimulation of the sensory nerves (deep lying as well as cutaneous) in the path of the manipulation.

Stretch Half Lying Double Hand and Foot Nerve Frictions, PP.

One assistant finds both median nerves where they lie internal to the first metacarpal bones; the other finds both internal plantar nerves where they lie in the soles of the feet; they then execute six to ten frictions simultaneously on these nerves. This is repeated three times. Many patients during this process feel a kind of lightning sensation throughout the body.

In patients with very dulled nervous systems, or in other cases where very powerful stimulation is required, frictions may be executed over several nerves simultaneously, such as cervical on both sides, both median in the hands, both internal plantar in the feet, both great sciatic in the buttocks, &c.

(5) Cutaneous Nerves of Congested or Œdematous Areas.

Running vibrations or frictions are frequently prescribed for such nerves. The part affected should be placed so that the venous and lymph return can proceed in the direction of gravity; thus if the condition be present in a leg, the patient is placed on his back in lying or half lying position, and that leg flexed to an angle of 30° or so with the horizontal, and supported in that position. The vibrations or frictions are then executed in a centripetal direction.

If done lightly, the effect of such manipulations is vaso-constriction of the vessels of the limb (see p. 152).

Nerve frictions and vibrations have now been considered in some detail. I have only to restate that this method of treatment has succeeded in eliciting a great many new physiological nerve continuities for which no anatomical explanations at present exist. A large field awaits the investigator, and doubtless scientific research will, in course of time, reveal the exact nature of these nerve continuities and accurately map them out on a sound anatomical basis.

II.—Vibrations and Shakings on Other Structures.

History and development.—In the 1840 edition[1] of P. H. Ling's "Gymnastikens Allmänna Grunder" very little is said

[1] *See* p. 155 of that work.

about shaking or vibration; in the 1866 edition[1] shaking is described, but not vibration. In Branting's gymnastic prescriptions of 1828-1839[2] many shaking movements are mentioned, and additional ones are described by him in his addresses to the graduates of the G. C. I. in 1842, 1843, 1846, 1848. Rothstein,[3] in 1847, distinguishes between "Erschütterung" and "Zitterung"; Neumann,[4] however, almost exclusively uses the former term. Georgii[5] in 1847, speaks of "tremblements." Roth,[6] in 1856, refers only to vibration; Hartelius,[7] in his handbook, speaks only of shaking, not of vibration.

A list of the shaking and vibrating movements which were in common use under Branting can be found in the writings of Neumann,[8] Roth,[9] Branting,[10] Georgii,[11] and Hartelius.[12] Sometimes shakings were administered simultaneously with active exercises, such as lower jaw shaking with alternate closing and opening of the mouth,[13] sitting head shaking with passive turning,[14] and sitting nose root shaking with trunk extension (the patient having first flexed his trunk on the hip-joints).[15]

When Henrik Kellgren began to deal with cases of acute specific infectious disease, he continually found it necessary to resort to manipulations of shaking and vibration; in consequence he was impelled to develop and improve these methods of treatment. No detailed or systematic account of them has yet been

[1] *See* p. 581 of that work.

[2] "Efterlemnade Skrifter," 1882, part 2, p. 1, &c., and gymnastic prescriptions at end of book.

[3] "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen P. H. Ling," 1847, pp. 69, 70.

[4] "Die Heilgymnastik," 1852, pp. 287, 292, &c., and "Lehrbuch der Leibesübungen," 1856, part 2, pp. 290, &c.

[5] "Kinésithérapie," 1847, pp. 47, &c.

[6] "Handbook of the Movement Cure," 1856, pp. 215, &c.

[7] "Lärobok i Sjukgymnastik," 1870, p. 100; 1883, pp. 102, &c.; 1892, pp. 101, &c.

[8] "Die Heilgymnastik," 1852, pp. 287-300.

[9] "Handbook of the Movement Cure," 1856, pp. 215-220.

[10] "Efterlemnade Skrifter," 1882, pp. 167-169; *see also* his gymnastic prescriptions, many of which are given in detail in that book.

[11] "Kinetic Jottings," 1880, pp. 137, 138.

[12] "Lärobok i Sjukgymnastik," 1870, pp. 101-104; 1883, pp. 102-106; 1892, pp. 101-105.

[13] *See* Branting's address to the graduates of the G. C. I., on April 8, 1848, and "Efterlemnade Skrifter," 1882, pp. 145, 237.

[14] *See* p. 184.

[15] *See* Hartelius, "Lärobok i Sjukgymnastik," 1870, p. 104; 1883, p. 105; 1892, p. 104.

published, although some of them were described by Arvid Kellgren [1] in 1888 and 1890.

The mistaken idea that what are known as Kellgren's methods comprised only vibrations (and no other form of movement) seems to have arisen during the period [2] defined by these two dates. It is a point of interest that during the last ten or twelve years there has been a great increase in the use of machines devised to administer mechanical vibrations; new forms of these are continually appearing on the market.

Various forms of vibrating machines had been invented long before the days of P. H. Ling, who himself refers to them.[3] Zander, of Stockholm, constructed his first vibrator in 1868; Liedbeck's is of later date. Mortimer Granville's [4] was produced in 1882. Since then some of the practitioners of Ling's medical gymnastics in Stockholm [5] have at intervals either advocated such appliances, or have stated, without actual recommendation, that they may be used to replace the hand of the gymnast. Those who are most favourably disposed allege that vibrations produced by machines can be administered with greater ease, while taxing less the powers of the gymnast, and that in consequence of this they will derive the advantage of a more perfect continuity.[6]

[1] "Vorträge über Massage," in "Statistischer Sanitatsbericht...für 1888"; "Technic of Ling's System of Manual Treatment," 1890.

[2] Nebel, "Bewegungskuren mittelst Schwedischer Heilgymnastik und Massage," 1889, p. 265; Hasebroek, "Die Erschütterung in der Zanderschen Heilgymnastik," 1890, p. 1.

[3] "Gymnastikens Allmänna Grunder," 1866, pp. 581, 585.

[4] *See* "Percussion as a Therapeutic Agent in Nervous Diseases," in *Brit. Med. Journ.*, 1882, vol. 1, p. 39; and "A Note on the Treatment of Locomotor Ataxia by Precise Nerve-vibration," in *ibid.*, 1882, vol. 2, pp. 559, &c.

[5] Branting, "Efterlemnade Skrifter," 1882, pp. 167, 168. Hartelius, "Lärobok i Sjukgymnastik," 1870, p. 100; 1883, p. 102; 1893, p. 101. Murray, Th. Brandt, Levin, &c. in Liedbeck, "Vibratorn, dess Ändamål, Beskrifning och Användning," 1891, p. vi.; "A Description of the Vibrator," 1891, page vi.

[6] *Cf.* Hasebroek, "Die Erschütterung in der Zanderschen Heilgymnastik," 1890, p. 2. Murray, Helleday, Wide, Zander, Wallgren, Levin, and Th. Brandt, in Liedbeck's "Vibratorn, dess Ändamål, Beskrifning och Användning," 1891, pp. vi., 1, 2; and Liedbeck's "A Description of the Vibrator," 1891, pp. vi., 1, 2; and in *Tidskrift i Gymnastik*, 1891, pp. 532, 533. Levertin, "Dr. G. Zander's Medico-Mechanische Gymnastik," 1892, p. 40; "Dr. G. Zander's Medico-Mechanical Gymnatics," 1893, p. 38. Weman, "Gymnastik Handskakningsmaskin," in *Tidskrift i Gymnastik*, 1895, p. 268. Wide, "Handbok i Medicinsk Gymnastik," 1895, p. 66; "Handbook of Medical Gymnastics," 1899, p. 65; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 62; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 73.

There is no doubt that the method of vibrating as employed by many of the practitioners of Ling's system of to-day is extremely tiring to the gymnast, the vibrations being produced by strong tetanic contractions of the muscles of the whole arm and shoulder[1] (see p. 139).

As, however, Kellgren's vibrations are in the majority of cases given from the wrist and finger-joints, with almost imperceptible contraction of the forearm muscles (see p. 136), they involve but slight exertion on the part of the assistant, who can continue to apply them as long and as evenly as in practice is desired. Personally, I have never given vibrations uninterruptedly for more than one hour and three quarters: but I am confident that I could maintain them for several hours if necessary. The great reason for preferring Kellgren's manual vibrations is that the assistant, having his sense of touch to guide him, can modify the strength, excursion and rate of the movement at any given moment should this become necessary. In some cases of great amount of pain from acute inflammation, say in the eyes or peritoneum, it is impossible to adjust accurately the strength of the machine vibrations, and certainly none of the advocates of the latter have ever recommended them for such pathological conditions. In some machine institutes even head and throat vibrations are given with the gymnast's hand placed between the vibrator and the part of the patient to be vibrated.

Physiological Effects of Manual Shakings and Vibrations on Structures other than Nerves.

It is impossible to make any comprehensive statement under this head, as the effects vary greatly with regard to different organs. Speaking generally, both shakings and vibrations (excepting the "suction" and "nipping" forms) promote the lymph and venous circulation, vibrations tending to cause vaso-constriction of the arterial vessels; shakings are more stimulatory and vibrations more soothing, the former being indicated for

[1] Whether Hj. Ling and Branting actually used this method I cannot say; but it seems probable from Neumann's description that they did (*see* "Die Heilgymnastik," 1852, pp. 288, &c). No precise details concerning the method of vibrating can be found in the writings of Branting, Georgii, Rothstein, Roth, Hj. Ling, or Hartelius.

chronic inflammations and lowered vitality, the latter for acute conditions.

Shakings executed from side to side have a much more superficial effect than those which are executed up and down and thus penetrate to the deeper tissues. The effects of suction vibrations, nipping vibrations, friction vibrations, and friction vibrations with suction, have already been alluded to when considering the *modus operandi* (see pp. 140 to 144).

The subject is one that has been only partially investigated, and further researches will be necessary before any far-reaching generalisations can be made. A good deal of work has been done on the Continent in connection with vibrations effected by means of machines, but what is true of machine vibrations is not always true of manual ones. Some authors, for example, employ machine vibrations in order to *increase* the temperature of the part manipulated; whereas the result of Kellgren's manual vibrations is in almost every case to effect a *decrease* in this respect.

Special effects on special organs will be referred to when describing the actual methods of manipulation.

Methods of Executing the various Vibrations and Shakings on Structures other than Nerves.

(1) On the Head.

A kind of head vibration was formerly used by the Ling school. Branting[1] mentions head lifting and shaking combined with active trunk extension (see p. 181), followed by double jugular vein pressure. Roth[2] says: "Head vibration is generally combined with passive alternate head turning. The gymnast stands on one side of the patient, by placing one hand on the forehead, and the other on the back part of the head, he turns it first to one and then to the other side, and at the same time vibrates it. The vibration is done for some seconds, and, after a pause, repeated two or three times." Neumann[3] also

[1] *See* his address to the graduates of the G. C. I., April 8th, 1848.
[2] "Handbook of the Movement Cure," 1856, pp. 215 and 216.
[3] "Die Heilgymnastik," 1852, p. 291.

describes the above in his writings. The manipulation, however, seems to have been abandoned, for in Hartelius' "Lärobok i Sjukgymnastik," 1870, 1883, 1892, no such exercise is described, nor does Wide mention anything like it in his handbooks.

Kellgren's head vibration.—The parts of the head usually vibrated are the frontal, parietal and occipital regions. The assistant places the terminal phalanges of three or four fingers on either of the first two regions mentioned, and those of the other hand on the last; he then sets up the vibrations in the usual way. A certain amount of pressure on the scalp is necessitated (as mentioned on p. 138); the pressure may vary from gentle to very strong, according to circumstances.

Vibrations on the medulla may be executed with the finger tips placed in the nape of the neck below the occipital protuberance. Vibrations may also be given on any other part of the head in order to specially affect any localised area of the brain.

(2) On the Eyes.

Either one or both hands may be used. In each case the patient closes his eyes. The assistant, while executing the vibrations, must take care not to move the patient's eyelids up and down, but to keep them steady on the eyeball, otherwise the manipulation becomes irritating and painful, and also fails to achieve more than a superficial effect. A properly executed eye vibration, even with so small an excursion as to be barely visible unless closely viewed, can be clearly felt by the hand of a third person through the back of the patient's head.

When using only one hand, the assistant stands at the side of the patient and places the terminal phalanx of the thumb on one eye and the terminal phalanx of the first and second fingers on the other eye; then the vibrations are set up.

When using both hands the assistant stands behind the patient and places the last two phalanges of the second and third fingers of each hand over the upper and lower eyelids of each side respectively; then the vibrations are set up.

Bilateral vibration, with the fingers of each hand placed respectively on each side of the orbit over the great wing of the sphenoid bone, can also be used, with the special object of affecting the deeper lying parts of the eyeball and the optic nerve.

(3) On the Nose.

The assistant may vibrate the root of the nose with the forefinger and thumb; by means of this he will often be able to stop an attack of epistaxis. One of the most rapid cures I have known took place with a girl, aged 17, who usually had such attacks twice a day, sometimes three times; the condition had persisted for a year. She received one treatment only, consisting of nose root shaking and head lifting, lasting about fifteen minutes. Two years have elapsed since then, but she has never been troubled again with any bleeding (see also pp. 48, 49).

Fronto-nasal Running Vibration.

One of the assistant's hands begins high up on the inner part of the frontal eminence; the fingers travel vertically downwards across the sides of the glabella, upper inner angle of the orbits, along the sides of the nasal bones, and then diverge as they go down the sides of the nose, an energetic vibration being meanwhile maintained. This may be followed by running vibrations or frictions on the supraorbital, supratrochlear, infratrochlear and nasal nerves. The other hand may either be used to support the head or to execute vibrations or shakings on the coronal suture. There is in many persons a small, quite well-defined area in the latter, on which shaking causes sensation inside the nose.

This manipulation produces a loosening of the mucus, and a tendency to diminution of any congestion of the mucous membrane of the nose. It is thus of advantage in coryza. With patients suffering from meningitis or other acute conditions of the brain accompanied by increased intracranial pressure this running vibration in particular should be resorted to; frequently the discharge from the nose will be greatly increased, some hæmorrhage ensuing that will improve the condition. Whether the discharge consists in part of cerebro-spinal fluid I cannot say with certainty.[1]

(4) On the Superior Maxilla.

Vibrations may be administered on this in cases of antral abscess. The assistant stands behind the patient; he places

[1] *Cf.* St. Clair Thomson, "The Cerebro-spinal Fluid, its Spontaneous Escape from the Nose," 1899.

the fingers of his one hand horizontally over the cheek, and then sets up the vibrations.

(5) On the Ear and Adjacent Parts.

(*a*) *On the meatus itself.*—The assistant standing in front of the patient, places the tip of the fore or little finger in the meatus and vibrates in a forward direction.

(*b*) *On the meatus through the tragus.*—Standing in front of the patient, the assistant places the tips of one or two fingers on the tragus, presses it inwards so as to occlude the external opening of the meatus, and then vibrates.

(*c*) *On the whole pinna and external meatus.*—The assistant stands in front of the patient and grasps the pinna, so that the last phalanx of his thumb and forefinger lie respectively on the concha and on the corresponding posterior surface of the ear. Drawing the pinna outwards so as to stretch the external meatus, he then administers the shakings.

(*d*) *On the external meatus from behind.*—The assistant stands in front of the patient and places the tips of his fingers behind the root of the ear in front of the mastoid process. He then sets up the vibrations or shakings forwards and upwards.

(*e*) *On the mastoid.*—The assistant, placing the tips of two fingers on the mastoid process, sets up the usual vibrations or shakings.

(6) On the Pharynx.

The pharynx may be shaken or vibrated in several different ways.

(*a*) The palmar aspects of the terminal phalanges of the first and second fingers are placed on each side respectively, just internal to the angle of the lower jaw. Keeping the whole hand horizontal, the shakings or vibrations are executed in an upward and forward direction.

(*b*) The palmar aspects of the thumb and fingers of one hand are placed on each side respectively, far back between the hyoid bone and the angle of the jaw. The shakings or vibrations are then given laterally.

(*c*) The palmar aspects of the tips of the fingers of each hand are placed on either side respectively behind the ascending

ramus of the jaw, and the shakings or vibrations given in a downward direction.

These manipulations also influence the tonsils.

(7) On the Salivary Glands.

(*a*) *The parotid gland.*—The fingers of the assistant are placed in the same position as in (*c*) (for the pharynx), and the shakings or vibrations executed, generally in a downward direction.

(*b*) *The submaxillary gland.*—The palmar aspects of the terminal phalanges of the first and second fingers are placed respectively on each side internal to the lower jaw, about midway between its angle and the mentum. Shakings or vibrations in an upward and forward direction are then administered.

(*c*) *The sublingual gland.*—The palmar aspects of the terminal phalanges of the first and second fingers are placed close together behind the mentum, and shakings or vibrations administered in an upward and forward direction.

(8) On the Larynx and Trachea.

(*a*) *The larynx.*—May be vibrated or shaken with the fingers and thumb placed respectively on either side of the thyroid cartilage.

(*b*) *The trachea* (*high up*).—May be treated in the same way with the finger and thumb on either side. In both cases the shakings should be given in a lateral direction.

(*c*) *The trachea* (*low down*).—The tips of the fingers are placed in the suprasternal notch, and the shakings executed in a sideways and upwards direction.

Bimanual vibration of the larynx and trachea.—This may also be made use of in some cases. The assistant standing behind the patient places the tips of all the fingers of both hands respectively on either side of the larynx or trachea, and then sets up the vibrations.

(9) On the Thyroid Gland.

In cases of enlarged thyroid gland or the thyroid of exophthalmic goitre, vibrations are executed as follows :—The thumb and fingers of one of the assistant's hands close on the gland, and

then lift it somewhat upwards; suction vibrations are then given in an upward and inward direction. In cases of atrophic conditions of the gland, shakings are substituted for vibrations.

(10) On the Arm.

Vibration of the whole arm with simultaneous traction has been described (p. 115).

(11) On the Leg.

Vibration of the leg with simultaneous traction has been described (p. 115).

(12) On one Lateral Half, or on the Whole of the Body.

Vibration on one lateral half, or on the whole of the body, with simultaneous traction has been described (pp. 115, 116).

(13) On the Thorax.

There are two different manipulations.

(*a*) *Shaking of the lower part of the thorax* (*commonly called side shaking*).—This is usually given with the patient in heave grasp standing or half lying position. The assistant stands in front of the patient as in fig. 75, his hands being placed

Fig 75

laterally on the lower ribs of each side respectively. Continually drawing the ribs slightly forwards, he makes a series of soft elastic pressures downwards, inwards and forwards, relaxing between each. During the relaxations the hands must not be moved on the thorax, but must maintain the original close contact. The elasticity of the ribs causes them to rebound each time the pressure is removed, and thus air is alternately pumped out and in of the lower part of the lungs. The pleuræ are also affected, and immobility from adhesions will give way to mobility, the adhesions themselves being gently broken down. The arrangement of the lymphatics of the intercostal spaces will aid in the absorption of the morbid products (see pp. 83, 84). The upper abdominal organs will also be subjected to alternating application and removal of pressure.

Side shaking as given above has a quieting effect on excited cardiac action; it is difficult to say whether this is due to promotion of the pulmonary circulation, to direct effect on the heart, to reflex effect on the heart through the sensory nerves, or to a combination of two or more of the above.

(*b*) *Vibration and shaking of the upper part of the thorax.*—The position of the patient is the same as for side shaking. The palmar aspect of the hand is placed anteriorly over the middle of the chest or over any part that is specially affected, and the manipulation is then executed in a somewhat downward direction. Its strength depends upon the nature of the malady; either shaking or vibration may be prescribed for chronic conditions, but as a general rule for acute ones only vibration is employed. The other hand of the assistant may be used either to vibrate posteriorly between the shoulder blades of the patient or over any other part that is specially affected, or to administer interscapular nerve frictions.

(14) On the Heart.

The patient is usually placed in half lying or heave grasp standing position before administering the ensuing manipulations.

(*a*) *Shaking of the heart.*—The assistant's right hand is placed on the front of the left half of the thorax low down, so that the thumb is over the xiphisternum, and the fingers somewhat spread out over about the fifth to eighth ribs laterally, as in fig. 76. The shaking is then given gently downwards, forwards and inwards.

(*b*) *Vibration of the heart.*—Vibrations may be given with the hand in the same position as for shaking, or the hand may be placed over the heart itself.

(*c*) A combination of (*a*) and (*b*) may be used.

The effect of the above manipulations is to improve the tone of the heart muscle so as to bring it to a condition in which there is a good systolic contraction and a normal diastolic period.

FIG. 76.

Kellgren's heart vibration and shaking has a similar effect to the local heart treatment of the Ling[1] school, which from its physiological effect has been termed "Branting's digitalis."

How can the physiological effect of vibration and other manipulations over the heart be explained? Some have regarded the whole phenomenon as being a reflex through the sensory nerves, the medulla, and the vagus. (Murray,[2] Lorand.[3]) I cannot, how-

[1] *See* Georgii, "Kinésithérapie," 1847, p. 84.

[2] "På hvilka fysiologiska grunder hvilar en rätt gymnastisk behandling af organiska hjertsjukdomar," in *Tidskrift i Gymnastik*, 1887 (pp. 603-613), p. 611.

[3] "Über die Manuelle Behandlung der Herzkrankheiten," in *Wien. Med. Presse*, 1895, Nos. 40 and 41.

ever, allow that this is the only channel of communication involved, although prepared to admit that it may be a minor one. If the theory specified were correct, the same phenomena in the heart should result from executing the manipulation on the corresponding *right* side of the body; this, however, is not the case.[1] I am of the opinion that a great deal of the effect of heart vibration is due to direct transmission of the propagated vibrations to the heart itself, and that the vibrations act by tending to restore the normal equilibrium between the two sets of fibres, augmentor and inhibitory, which has become disturbed through increased or decreased excitability of either of them. A number of statistics concerning the effect of heart vibration, as given by the Ling school, in cases of organic cardiac disease (taken from patients under treatment at the G. C. I.) have been published by Levin; the reader is referred to these.[2]

(15) On the Spinal Cord.

In the case of any acute inflammatory condition, &c., of the spinal cord, vibrations may be given on the seat of the lesion (as determined from the symptoms) with the finger tips placed close to the middle line on either side of the spines of the overlying vertebræ.

(16) On the Abdomen in Whole or in Part.

(*a*) *On the abdomen as a whole.*—The assistant's hand is placed over the front of the patient's abdomen in about its middle, the fingers being spread out so as to obtain the greatest range possible. The hand may exercise a fair amount of pressure and apply shakings, or may rest very lightly, and instead administer vibrations. The former manipulation is stimulatory; the latter sedative.

(*b*) *On the pit of the stomach* (often called subcostal shaking). —The assistant's fingers are placed in the subcostal triangle, and shakings executed in a backward and downward direction (fig. 77.) The solar plexus is influenced by this, as also are the

[1] It would be of interest to study the effect of this manipulation in such cases as complete transverse myelitis above the fifth dorsal vertebra, in which all propagation of sensation to the medulla is eliminated.

[2] "Bidrag till kännedomen om sjukgymnastiska rörelsers inverkan på rytmen vid organiska hjertfel," in *Tidskrift i Gymnastik*, 1892 (pp. 698-704), pp. 702, &c.

duodenum, pancreas, &c.; and spasm of the diaphragm can be relieved by its means.

(*c*) *On the liver.*—See p. 231.

(*d*) *On the gall-bladder.*—See p. 231.

(*e*) *On the spleen.*—See p. 232.

(*f*) *On the kidneys.*—See p. 232.

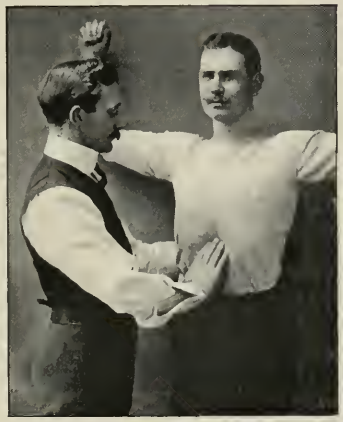

Fig. 77.

(*g*) *On the bladder.*—See p. 168.

(*h*) *On the male genital organs.*—See p. 233.

(*i*) *On the female genital organs.*—See pp. 235, &c.

(*j*) *On the anus.*—See p. 233.

(*k*) *On the anal canal.*—See p. 233.

(17) Over Ulcers and Wounds, &c.

A piece of lint is placed between the hand of the assistant and the ulcer (or wound, &c.), and the vibrations given through it. They appear to materially hasten the healing process.

(18) Around Abscesses.

Suction vibrations should be given in such cases. They keep the abscess from spreading, and hinder the absorption of its

products. Pointing takes place more quickly, and thus the abscess opens sooner; after it has done so the pus, &c., is removed more painlessly and completely.

(19) On Joints.

Several kinds of vibration and shaking of joints are used, as follows:—

(1) *Stationary vibrations* can be executed by placing the fingers on the joint; the vibrations will be transmitted to it.

(2) *Vibratory traction.* — One hand is placed immediately above the joint, and the other below it; then, maintaining traction, simultaneous vibration is set up with both. An extremely fine alternating flexion and extension, abduction or adduction, or rotation, with traction, is effected at the joint.

(3) *Shaking with traction.*—If shaking be substituted for vibration in (2), the effect is increased owing to the greater excursion of the movement.

(4) *Vibration with simultaneous gentle passive movement at the joint.*—One hand vibrates the joint as in (1); the other keeping up traction performs passive slow flexion and extension, abduction and adduction, or rotation, at first through the smallest range, but soon gradually increasing it.

In cases of very painful joints or apparent anchylosis, it is sometimes possible by "persuasion," with the above methods, to gradually re-establish the normal amount of movement. They will often succeed when force will do nothing, owing to the muscular contraction that results, in part reflex, and in part direct from the pain induced.

III.—Frictions on Other Structures.

By friction is meant not "massage" in the strict sense of the word (see p. 210), but a manipulation resembling a nerve friction, the fingers being drawn sharply across the structure under treatment, thus stimulating it.

Frictions on Muscles.

One of the muscles on which frictions are most frequently employed is the erector spinæ and its various sub-divisions.

The patient first assumes some position such as forwards lying, in which the muscles specified are relaxed; the assistant, placing his fingers or thumb over these muscles, close to the spines of the vertebræ, gives the frictions from within outwards. If it is desired to stimulate one special segment of the muscle the manipulation is repeated as above several times on the same spot; but if it is desired to affect the erector spinæ as a whole, the assistant begins in the upper dorsal region, and passing downwards administers a friction opposite each vertebra until the lower part of the sacrum is reached.

In a similar manner frictions may be administered on any other muscle that does not lie too deep.

The effect is stimulatory. The muscles are excited to contraction, a vaso-dilatation ensues in them, and their venous and lymphatic flow is furthered; any nerve trunks that lie in the substance of, or immediately in contact with the muscle are stimulated, being affected much as in the case of nerve friction In most cases of paralysis agitans, frictions on the extensors on the back of the forearm can entirely remove the tremors for a few seconds. In normal persons frictions on these muscles generally bring about a contraction in the same.

Trunk Stretching, PA, Spinal Muscle Frictions, PP.

This movement is prescribed for spinal curvatures. The patient assumes either half lying, reach grasp, or stretch grasp standing position, and then stretches himself to his utmost, so as to straighten his vertebral column as much as possible. While the patient does this the assistant gives strong frictions near to the spine on the muscles (this will include the nerves) situated at the point of greatest convexity of the curve (or curves, if there are more than one), *i.e.*, where the muscles are weakest.

The spinal curvature tends to be corrected, because the patient, while trying to straighten the vertebral column, makes use of the weakened muscles, which will be exercised at the expense of their contracted and stronger antagonists. The manipulation of the assistant aids the process by stimulating the weakened muscles in question.

Frictions on the Salivary Glands.

The position of the assistant's fingers is the same as for vibrations and shakings on these structures (p. 188). The direction of the frictions is as follows:—

(1) Parotid gland; downwards.
(2) Submaxillary gland; forwards.
(3) Sublingual gland; forwards.

Frictions on the Abdominal and Pelvic Organs.

These will be described on pp. 231, &c.

Frictions round Ulcers.

Friction vibrations, or friction vibrations with suction can be made use of. The method has been described on p 143.

HACKING, CLAPPING AND BEATING.

The various exercises indicated by the above titles have been included by some writers under the comprehensive term "tapotement." There are, however, well-defined differences between Kellgren's methods and those of other schools.

Hacking, clapping and beating may be defined as the administering in rapid succession of a series of short, sharp, elastic strokes with the hands. It is of the greatest importance that the finger, wrist and elbow-joints be kept loose during the process; otherwise the manipulation becomes one of banging, thumping and bruising.

Hacking.—Takes place thus: the forearm is in the mid-position with the fingers slightly separated from one another and

Fig. 78.

somewhat flexed in all the phalangeal joints, each inner finger being more flexed than its outer neighbour. As the hand goes to the part to be hacked the forearm is supinated a little, so that the dorso-ulnar surface of the fingers meet it (fig. 78).

In confirmation of the statement in par. 1, above, it may, for example, be pointed out that this method is quite different from

that of Hoffa. He says (the passage is translated),[1] "Hacking (tapotement) takes place as follows: both hands of the masseur, kept in the mid-position between pronation and supination, are held vertically over the part to be treated. While bringing them into *complete supination*, the abducted finger tips, without too much force but with a fair amount of speed, and above all very elastically, hack the part of the body in question. While doing this the *finger and wrist-joints should be kept as stiff as possible*, and as a consequence the *shoulder-joint takes a more active part*." (The italics are mine.—E. F. C.)

FIG. 79.

It may be added that the illustration given by Hoffa does not correspond with the description. Such discrepancies are, however, frequently met with in works on massage and gymnastics.[2]

CLAPPING.—The principle is the same as for hacking, but the whole palmar aspect of the hand and fingers (which are slightly flexed) is used (fig. 79).

BEATING.—The principle is the same as for hacking and clapping, but the loosely-closed fist is used; the dorsal aspect

[1] "Technik der Massage," 1897, pp. 13 and 14; *see also* his "Kinesithérapie," 1898, p. 489.

[2] It is very curious to see in such works the same illustrations, often with different descriptions pertaining to them, appearing in successive works by different authors. Some are so repeatedly encountered that they may be regarded as forming a kind of stock set.

of the last two phalanges of all the fingers and the proximal part of the palm meet the surface it is desired to stimulate (fig. 80.)

Hacking and clapping are administered with both hands, the strokes being delivered, as a general rule, with each hand alternately ; beating, however, is nearly always administered with only one hand.

Fig. 80.

The effect of the above manipulations is in each case stimulatory. The vessels and nerves of the skin will be stimulated, especially by clapping. The vibrations set up by the manipulations will be propagated to the underlying structures, *i.e.*, the muscles, nerves, vessels, &c., and, in the case of the trunk, to the viscera and spinal cord. The individual muscle fibres are urged to greater activity, and actual contraction may take place ; this is partly due to direct effect on the muscular tissue. The effect on the deeper lying arteries is first vaso-constriction, then vaso-dilatation, and finally a return to the original state. As first

shown by Gubler[1], hacking over distended veins causes them to contract.[2]

Further details as to effect will be given in connection with the individual parts specified.

I.—Hacking.

(1) *Shoulder hacking.*—The strokes are administered on both sides of the body above and between the shoulders. The patient may either be in reach grasp stoop fall standing, or forwards lying position, &c., *i.e.*, one in which the dorsal muscles are relaxed, or he may do some active exercise such as reach grasp stoop fall standing double elbow flexion and extension, PA, during the course of the manipulation.

(2) *Back hacking.*—Is administered simultaneously on both sides of the spinal column from the uppermost dorsal down to the lowest lumbar vertebra, and then back again. The patient may be in reach grasp stoop fall standing position, or may perform some suitable active exercise, such as the one just mentioned, or stretch stride standing bending forwards, PA, &c. (fig. 78).

(3) *Hacking of the whole posterior surface of the body* (often called length hacking).—Is administered simultaneously on both sides of the body from shoulders to heels. The position of the assistant's hands varies with regard to the different regions traversed. In the interscapular regions they are kept with their long axes parallel to one another and to the spine; in the lower dorsal region the hands are somewhat separated, and their direction is gradually changed so that in the kidney region they lie with their long axes at right angles to the long axis of the body. In this attitude one hand passes down the posterior aspect of the gluteal region and the left leg to the ankle-joint, while the other passes down the corresponding parts of the right limb.

[1] "Contractilité des veines," in *Comptes rend. de la Société de Biologie*, 1849 pp. 79, 80. *See also* Hill, "The Mechanism of the Circulation of the Blood," in Schäfer's *Text-book of Physiology*, vol. ii., 1900, p. 119.

[2] *Cf.* Wide, "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 45, who says, concerning hackings, "On the whole, they have a stimulating effect, which can probably be explained from the fact that at each stroke a number of peripheral nerves are affected." *See also* "Handbok i Medicinsk Gymnastik," 1895, p. 38; "Handbook of Medical Gymnastics," 1899, p. 37; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 36.

(4) *Hacking over the lumbar region.*—Is administered over the parts between the last ribs and the crests of the ilia. It may take place with the patient passive, such as in forwards lying position, or while an active exercise is being performed, such as stretch stride standing bending forwards, PA, reach grasp standing knee flexion and extension, PA, &c.

(5) *Hacking of the whole lateral aspect of the body.*—The patient assumes side lying position. The hacking is administered over the posterior scapular region, axilla and external aspect of the trunk and leg on the side that lies uppermost. This may be called side length hacking.

(6) *Hacking of the lateral aspect of the legs.*—The patient assumes side lying position. The hacking is administered on the lateral aspect of the uppermost leg from the crest of the ilium down to the ankle. This may be called side leg hacking.

(7) *Hacking of the arms.*—The patient's limb is placed in yard grasp position. The hacking is administered on its upper and lower surfaces simultaneously.

(8) *Hacking over the spleen.*—Is administered on the left side on the ninth to eleventh ribs in the splenic area, with the patient in left side span standing or right side lying position. Georgii [1] says that he found that mere percussion of the spleen sometimes caused diminution in its size. If this be so hacking should have a similar effect, but greater in proportion as it is a more powerful manipulation. The reduction in size is probably due to stimulation of the nonstriped muscular fibres, causing them to contract, just as in the case of hacking and clapping over the heart (p. 203).

(9) *Hacking over the liver.*—Is administered over the fifth to tenth ribs laterally on the right side, with the patient in right side span standing or left side lying position.

(10) *Hacking over the kidneys.*—Is comprised in the manipulation on the lumbar region.

(11) *Hacking on the anterior surface of the abdomen.*—Is rarely resorted to, being very severe; it is advantageously replaced by other manipulations. However, many continental books recommend it.

(12) *Hacking over the heart.*—May be administered by itself; more usually chest clapping is substituted for it (p. 203).

[1] "Kinetic Jottings," 1880, p. 97.

(13) *Hacking on the head.*—Was at one time used by Swedish gymnasts; personally, I prefer head vibration and head nerve frictions. A modified kind of hacking with the finger-tips is advocated by Wide[1]; this manipulation, however, I regard as of extremely little value.

(14) *Hacking over muscles* that are rheumatic or chronically inflamed is useful in diminishing pain, stiffness, &c., and breaking up the inflammatory products.

(15) *Hacking over subcutaneous effusions.*—May be sometimes used in order to assist in their absorption.

II.—Clapping.

This is chiefly used in the form of chest clapping, *i.e.* :—

Heave Grasp Standing Chest Clapping, PP.

The assistant stands in front of the patient and passes his arms round the latter's chest, so that his hands lie over the supra-scapular regions with their palms looking directly forwards (towards himself), his forearms being thus completely supinated. Then, with loose elbows, wrist and finger-joints, he administers a series of short sharp strokes, first over the suprascapular and scapular regions, then continuing vertically downwards until the lowest parts of the lungs are reached. Gradually pronating his forearms as they travel, he continues the clappings round the sides of the thorax over the lower ribs; and last of all, with his forearms completely pronated, he similarly works up the front of the chest to above the clavicle (fig. 79). With female patients the clappings should be given nearer to the sternum while passing up the front of the chest, in order to avoid the mammary glands.

Effect on the lungs.—The lungs are stimulated, expectoration is facilitated, and respiration after the close is freer and deeper. Part of this is due to the propagated vibration from the manipulation, and I think I am also right in saying that a good deal of the effect is due to stimulation of the sensory nerves of the thorax, chiefly those of the skin; perhaps the afferent fibres of the vagus

[1] "Handbok i Medicinsk Gymnastik," 1895, pp. 38, &c.; "Handbook of Medical Gymnastics," 1899, pp. 37, &c.; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, pp. 36, &c.; "Handbook of Medical and Orthopædic Gymnastics," 1903, pp. 45, &c.

are also involved. Whether or not chest clapping causes contraction in the nonstriped muscular fibres of the trachea, bronchi, &c., and whether it does or does not increase the ciliary movement are matters for future investigation.

Effect on the heart.—The heart is stimulated as in the case of heart vibration (p. 190), only to a greater extent. The physiological reasons for this are probably as follows:—

(1) There is a nervous element involved similar to that described under heart vibration.

(2) There is a direct effect on the muscular tissue of the heart itself.

(*Cf.* Heitler.[1] See also hacking over the spleen, p. 201).

Clappings may be administered on the extremities; the principle is the same as for hacking. The effect, however, is more superficial; the cutaneous nerves and vessels in particular are stimulated.

Clapping of the soles of the feet is useful in cases of partial or total anæsthesia, which so readily cause difficulty in the preservation of equilibrium. "The greater the susceptibility of the sole of the foot the safer does one stand. Vierordt placed on the vertex of a man's head a fine writing style, which pointed upwards, and over its free end a piece of smoked paper was stretched horizontally. When the man was standing the swayings that ensued in his head were depicted in the form of a closed curve, whose diameter became smaller the steadier the man stood. If by means of placing the feet in ice-cold water, or inunction thereof with chloroform, their susceptibility was diminished, the swayings increased, and the diameter of the curves described became proportionately larger" (J. Munk[2]).

III.—Beating.

Reach Grasp Step Standing Knee Flexion and Extension, PA, Sacral Beating, PP.

While the patient executes the active part of the above movement, the assistant administers the beatings as follows: during

[1] "Über akute Herzerweiterung," in *Wien. Med. Wochenschr.*, 1882, No. 23; and "Über die Wirkung thermischer und mechanischer Einflüsse auf der Tonus des Herzmuskels" in *Centralbl. f. die ges. Therapie*, 1894.

[2] "Physiologie des Menschen und der Säugethiere," 1892, p. 361 (translated).

flexion of the knee, over the upper part of the sacrum and upper and inner parts of the gluteal regions; during extension, down the sacrum so that the final ones take place over the coccyx just as complete extension is attained (fig. 80).

Sacral beating can also be administered with the patient in forwards lying position.

The sacral nerves, gluteal regions, rectum, and pelvic organs[1] are stimulated; the last-mentioned are affected in part directly through propagation of the vibrations set up by the beatings, and in part indirectly through reflex action from the sacral nerves.

Beating down the spinal column in the middle line posteriorly may be used in spinal cord conditions. The results are the same as from back hacking, although more marked. It is a curious fact that, although one bad concussion can have such a destructive effect on the spinal marrow, yet a number of very minute ones, such as are brought about by these manipulations, have the opposite effect (*cf.* Georgii[2]).

Beatings can also be made use of over various groups of muscles, œdematous parts of the limbs, &c., as desired.

[1] *Cf.* Liljevalch, "Rapport öfver Veneriska Sjukdoms Förhållanden i Kongeliga Allmänna Garnisons Sjukhuset i Stockholm under år 1839"; *also* Thure Brandt's various works (a list is given on p. 234).

[2] "Kinetic Jottings," 1880, p. 128.

STROKING.

The assistant's hand is placed so that the palmar aspect of two or more fingers, with or without the thumb, and with or without the palm itself, lies in contact with the part to be manipulated. The hand is then slowly made to travel over the skin of the part (*i.e.*, the hand and skin do not move in unison over the underlying structures, as is done in kneading, p. 207); this is done, unless contra-indicated, in a centripetal direction, a certain amount of pressure being exercised simultaneously. The hand is then lifted off and brought back to its original position, whereupon the manipulation is repeated several times, the whole operation lasting from half a minute to two or three minutes.

Pure stroking movements are not employed very much by Henrik Kellgren, who as a general rule replaces them by vibratory strokings and other manipulations. They may, however, be employed once or twice in succession to act as a sedative on the nerves of the skin after clappings or other nerve-stimulating manipulations.

Such vibratory strokings should be administered *centripetally* when it is desired to further absorption by the veins and lymphatics, but *centrifugally* when dealing with cases such as lymphangitis from wound infection, &c., when it is desired on no account to promote absorption, but instead to prevent it, and also to bring the toxic matters back to their point of entrance and thus remove them (see lymphangitis).

Pure stroking movements are, for all practical purposes, equally effective when a linen garment is interposed between the assistant's fingers and the skin of the patient; this applies also to vibratory strokings administered centripetally. The point will be further considered under kneadings (see p. 212). Vibratory strokings administered centrifugally should, however, as a rule be given on the bare skin, as in order to produce the due effect it is necessary to follow the exact route of the red lines that mark out the affected lymphatic vessels.

Physiological effect of strokings and vibratory strokings:—

(1) Given centripetally:—

(*a*) The venous flow is hastened.

(*b*) The lymphatic return is promoted, and effusions, &c., are absorbed.

(*c*) The cutaneous nerves are affected; they are soothed by light strokings, somewhat stimulated by stronger ones, and stimulated most of all by vibratory strokings.

(*d*) The underlying muscles are directly stimulated to a slight extent.

(*e*) Occasionally reflex effects through the sensory nerves are obtained.

The greater the amount of pressure that is applied the deeper will the effect of the manipulation penetrate.

(2) Given centrifugally. See p. 205.

KNEADING.

This manipulation is directed especially at subcutaneous tissues, such as muscles, tendons, joints, &c., and, in the case of the abdomen, the internal organs, although the intervening skin is naturally to some extent also affected.

There is, perhaps, in the whole range of the manual treatment no class of manipulations more difficult to describe than that of kneadings; it will be best to consider the more important methods separately instead of framing any generalisation. The following varieties will be described :—

(1) Of muscles.

(*a*) When a definite lesion is present in a particular muscle or part thereof.

(*b*) When no such lesion is present, and it is only desired to stimulate rapidly all the muscles of a limb.

(2) Of joints.

(3) Of effusions.

(4) Of the abdomen.

(1) Kneading of Muscles.

During this manipulation the muscles must be kept passive and relaxed, not stretched.

Cases requiring kneading of a definite lesion in a muscle.—The assistant's fingers and thumb are kept as far as possible extended in their interphalangeal joints, although as loose as is compatible with the proper elastic execution of the movement. The method of application depends on the situation of the muscle under treatment. Should more than one surface of the patient's muscle be accessible, the assistant grasps that muscle between his fingers and thumb; the point of application of his grasp being, however, not over the actual part to be kneaded, but a little above it. Then, the skin of the patient moving in unison with them, the assistant moves his fingers and thumb backwards until they lie over the part in question. If the condition laid down be not complied with the range of the movement is diminished. The patient's skin moving constantly in unison with them, the

assistant's fingers and thumb are carried forwards in a centripetal direction,[1] meanwhile applying pressure towards one another and against the underlying structures until the patient's skin is on the stretch, when the movement forwards should be arrested. Then the assistant's fingers and thumb, relaxing their pressure, pass back again to their original position. The direction of the movement should not be simply forwards and backwards, but more in the form of an ellipse, so that the patient's muscle is moved alternately to one side when the fingers and thumb proceed forwards, and to the other side during the reverse process. The manipulations should be repeated uninterruptedly for a minute or two.

Should only one surface of a patient's muscles be accessible, the assistant uses only the fingers (or else the thumb), placed over the part to be manipulated. The kneading takes place as before, with pressure exercised towards the underlying structures. The manipulation can be administered with one or both hands. In the latter case, the hands are placed at a different level, and both alternately execute the same movement as did the one hand; or else the fingers of the one hand can be used to replace the thumb of the other. In the former case the second hand is used to steady the part manipulated.

Cases requiring rapid stimulation of all the muscles of an arm or leg.—The assistant uses both hands, and beginning at the patient's hand or foot, on opposite sides of the limb, executes with each hand the movement as first described, with this exception, that after each individual kneading his hands move to a higher level before repeating it, thus passing rapidly up the limb. He may also execute the manipulation beginning at the trunk and passing down the limb, his hands moving to a lower level after each individual kneading, although the direction of each such manipulation is centripetal as before.

In some cases kneadings may be given centrifugally; the reasons for doing so are the same as those mentioned under vibratory strokings (p. 205). The *modus operandi* is the same as for centripetal kneadings, excepting that the direction of the movement is reversed, *i.e.*, the hand begins below the muscle to be manipulated, is carried centripetally until it lies over it, and the actual kneading given centrifugally.

[1] *See* below for exceptions to this rule.

(2) Kneadings of Joints, Bones, &c.

These are executed in the same manner as the kneadings of those muscles which are only accessible on one surface.

(3) Kneadings of Effusions.

The method adopted depends upon the site of the effusion :—

(*a*) Effusions into the peritoneal cavity.—Are treated by means of stomach exercise (see p. 227).

(*b*) Effusions into a synovial cavity of a joint.—Are treated by kneading of the same type as described under (2) above.

(*c*) Effusions into tendon sheaths, and arising from dislocation, fracture, &c.—Are treated by kneading of the same type as is used for muscles of which only one surface is accessible.

Kneadings of such effusions are usually continued for a longer time than those of muscles. For whatever reason kneadings are made use of, they should, whenever possible, be supplemented by passive movements at joints, duplicate exercises and nerve frictions, &c.

(4) Kneading of the Abdomen.

See stomach exercise (p. 227).

Physiological Effects of Kneadings :—

(1) Kneading of Muscles.

(A) given centripetally.

I.—*Local effects.*

(*a*) The venous flow is accelerated.

(*b*) The lymphatic circulation is furthered.

(*c*) A preliminary vaso-constriction takes place, lasting only a very short time; this is followed by vaso-dilatation, an increase of arterial blood being supplied to the muscles.

(*d*) The tone of the muscular fibres is improved.

(*e*) The nerves of the muscles are stimulated; this is, I believe, a more important factor than has hitherto been allowed.

(*f*) Pathological products are broken down and absorbed.

II.—*General effects.*

(*a*) The blood pressure is diminished, and the heart relieved of some of its work.

(*b*) The metabolism as a whole is increased.

(These general effects only arise if the kneading manipulation be executed over a large area.)

(B) GIVEN CENTRIFUGALLY. See vibratory strokings, p. 205.

(2) KNEADING OF JOINTS.

The ligaments and neighbouring muscles and tendons are stimulated; at the same time that vaso-dilatation occurs in these structures the lymphatic and venous return is promoted. The fluid of chronic synovitis in the joint will tend to be absorbed and thickenings of the synovial membrane itself will be removed.

(3) KNEADING OF EFFUSIONS.

The effused matter is more quickly absorbed.

Definition of "Massage," and some Notes on the Introduction of Metzger's Methods into Ling's System.

To no term in gymnastic literature have there been attached in the course of time so many different meanings as to the term "massage." Some authors denote by it all exercises, whether active or passive, that exist in connection with medical gymnastics; others have attempted to draw a hard and fast line between massage and medical gymnastics, as if between things definitely dissimilar; many take massage to denote "effleurage," "petrissage," "massage à friction," and "tapotement," according to Metzger's methods; and there exist compromises between these different standpoints of innumerable variety.

For myself I consider that the word "massage" should be restricted to denote merely Metzger's "effleurage," "petrissage," and "massage à friction."

Although P. H. Ling,[1] Neumann,[2] Rothstein,[3] Roth,[4] have described kneadings of muscles, none of them use the word "massage" in their writings. In 1873 two Swedish medical men, Berghmann and Helleday, visited Metzger in Amsterdam, learnt his methods[5] and made efforts to introduce them into

[1] "Gymnastikens Allmänna Grunder," 1866, p. 582.

[2] "Die Heilgymnastik," 1852, pp. 284-287.

[3] "Die Gymnastischen Rüstübungen," 1861, pp. 93, &c.

[4] "Handbook of the Movement Cure," 1856, pp. 212-214.

[5] Their description of these methods is to be found under the title of "Anteckningar om Massage," in *Nordiskt Medicinskt Archiv*, 1873, vol. v., part 1, No. 7.

Sweden. Although Metzger's manipulations were inferior to Ling's, they have gained a good deal of ground in Sweden during the last few years, although not without a good deal of opposition from various quarters. The differences between the two methods, the history of the term massage, and its introduction into Ling's system have been discussed by Curman,[1] Hartelius,[2] Georgii,[3] Branting,[4] and others. At the present moment in Sweden, Metzger's methods are advocated by Wide[5]; and massage manipulations have, I regret to say, come so much to the fore that they have in many cases entirely superseded other movements, both active and passive, of a more beneficial nature.

The differences between Henrik Kellgren's kneading, and Metzger's petrissage ("massage") and allied methods are as follows:—

(1) The fat (vaseline, &c.) used in massage renders the movement one of the masseur's fingers over the skin; thus the deep lying structures are much less likely to be affected. In the Kellgren method the assistant's fingers and the skin of the patient move *as one* over the underlying structures, which are thus affected to a far greater extent.

(2) The fat used in massage prevents skin secretions by clogging the orifices of the sebaceous and sweat glands. This is especially apt to produce unpleasant effects, because any form of friction or massage of the skin greatly increases the insensible perspiration.[6] Often the so-called "massage eruptions" arise, and the treatment has to be stopped until these have passed away.

(3) Massage is given with more violence and easily causes hyperæmia of the skin, actual soreness, or even rupture of capillaries. "A great drawback to continuing massage is the wounding

[1] "Om Massage eller Manipulationers Användande för Hygieniskt och Therapeutiskt Ändamål," in *Hygeia*, 1873, April, pp. 222-238.

[2] "Historik om den s.k. Massagen," in *Tidskrift i Gymnastik*, 1874, part 2, pp. 49, &c.; *see also* "Om Sjukgymnastiken vid Gymnastiska Central Institutet under år 1863," 1864, p. 8; "Gymnastiska Iakttagelser," 1865, pp. 37, &c.

[3] "Kinetic Jottings," 1880, pp. 180-186.

[4] "Efterlemnade Skrifter," 1882, pp. 184, 185.

[5] "Handbok i Medicinsk Gymnastik," 1895, pp. 145, &c.; "Handbook of Medical Gymnastics," 1899, pp. 145, &c.; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, pp. 136, &c.; "Handbook of Medical and Orthopædic Gymnastics," 1903, pp. 153, &c.

[6] Weyrich, "Die Unmerkliche Wasserverdunstung der menschlichen Haut," 1862, p. 206, *et seq.*

of the skin" (Hoffa).[1] In such a case, of course, the treatment has to be stopped for some days on account of the pain that would be caused were the manipulation to be continued regularly.

It is for this reason that, it being impossible to give massage to recent sprains, dislocations, &c., the so called "einleitungsmassage"[2] has been advocated. This takes place *around* the part but not *on* it, and in consequence much valuable time is lost, as any exudation, &c., is allowed to accumulate and organise.

(4) Massage is given over a much longer time; each *séance* often lasts from half an hour to an hour. This is quite unnecessary, as active and passive movements at joints produce the desired result much more quickly and efficaciously.

(5) Kneadings, according to Kellgren's method, are always executed (unless it be specially contra-indicated) not on the bare skin like massage, but with ordinary thin underclothing, preferably linen, between the skin of the patient and the assistant's fingers. This is in order to give steadiness to the manipulation, to prevent hyperæmia arising in the skin and to prevent the unpleasantness of the contact of two skin surfaces.

(6) Some authors recommend first stretching the muscles to be massaged; this proceeding is, for example, frequently advocated in connection with massage for the gluteus maximus. When administering kneadings according to Kellgren's method the muscles to be manipulated should be relaxed (as already stated), because otherwise the effect of the manipulations penetrates far less deeply.

Space does not permit me to go into details concerning the chief experiments on the physiological phenomena which result from various forms of massage. Lists of the literature can be found in—

(1) Reibmayr, "Die Massage und Ihre Verwerthung in den verschiedenen Disciplinen der Praktischen Medicin," 1893.

(2) Kleen, "Handbok i Massage," 1894.

(3) A. Bum, "Mechanotherapie," in Eulenburg's "Encyclopädie," 1897.

(4) A. Bum, "Handbuch der Massage und Heilgymnastik," 1901.

[1] "Technik der Massage," 1897, p. 15; and "Kinesitherapie," 1898, p. 490 (translated.)

[2] *See* Reibmayr, "Die Technik der Massage," 1898, p. 5, *et seq.*

PRESSING.

Nerve pressings such as are made use of in Ling's system have been referred to already (pp. 145, &c.).

Pressure on arteries, otherwise than for the purpose of arresting hæmorrhage from cut vessels, was formerly employed at the G. C. I., and is mentioned in the writings of P. H. Ling,[1] Georgii,[2] and Hj. Ling.[3] Pressure on the abdominal aorta has been employed by Branting and Liedbeck to check hæmorrhage, post-partum or otherwise, from the uterus (Georgii[4]).

Pressure on veins was formerly employed by the Ling school, and is mentioned in the works of P. H. Ling,[5] Branting,[6] Neumann,[7] Rothstein,[8] Roth,[9] Hj. Ling,[10] and Georgii[11]. These manipulations seem, however, in later times to have fallen into disuse. Hartelius[12] makes no mention of them in his handbook, and similarly Wide does not refer to them in his handbooks.

They are excellently typified by bilateral jugular vein compression, which will often cure rapidly a case of fainting from anæmia cerebri. I have known this result to be obtained when even cervical nerve frictions (see p. 162) have failed.

Pressing downwards, forwards, and backwards are terms used in connection with some leg and arm movements. These have already been described.

[1] "Gymnastikens Allmänna Grunder" (1834), 1840, p. 160.

[2] "Kinésithérapie," 1847, pp. 51, 71; "Kinetic Jottings," 1880, pp. 55, &c., 89, 106, &c.

[3] In Branting's "Efterlemnade Skrifter," 1882, p. xvi.

[4] "Kinésithérapie," 1847, p. 51; "Kinetic Jottings," 1880, p. 89.

[5] "Gymnastikens Allmänna Grunder," 1866, pp. 584, &c.

[6] Address to the graduates of the G. C. I. on April 8, 1848, and gymnastic prescriptions in "Efterlemnade Skrifter," 1882.

[7] "Die Heilgymnastik," 1852, pp. 208, &c.; "Lehrbuch der Leibesübungen," 1856, p. 265.

[8] "Die Gymnastik nach dem System des Schwedischen Gymnasiarchen P. H. Ling," 1847, p. 67.

[9] "Handbook of the Movement Cure," 1856, pp. 175, &c.

[10] "Förkortad Öfversigt af Allmän Rörelselära," 1880, pp. 24, 60, &c.; Branting's "Efterlemnade Skrifter," 1882, pp. xxiv., &c.

[11] "Kinésithérapie," 1847, pp. 54, &c.; "Kinetic Jottings," 1880, pp. 67, 68.

[12] "Lärobok i Sjukgymnastik," 1870, 1883, 1892.

VARIOUS OTHER EXERCISES WHICH DO NOT FALL UNDER ANY OF THE PREVIOUS HEADINGS.

Standing Vertebral Column Stretching, AR at Patient's Head.

The patient assumes the standing position usually with his back against a wall. The assistant places one hand lightly over the patient's abdomen in order to steady him, and the other over his lambda. The patient endeavours to stretch upwards (*i.e.*, to

Fig. 81.

make himself as tall as possible without rising on his toes) and backwards, the assistant resisting by drawing in the opposite direction. No actual movement should result, the assistant taking care that the opposing forces just neutralise each other (fig. 81).

This exercise powerfully influences the extensor muscles of the spinal column, and is an excellent corrective for curvatures of the latter.

If properly executed, its effects will be felt most markedly in the lumbar region.

Standing Stretching of the Calf Muscles, PA.

The patient, keeping his heel on the ground, flexes one foot to about 30° by resting it on an inclined plane or some other suitable support. Keeping the knee of that side fully extended, he then flexes his ankle still further, simultaneously moving his trunk forwards, thus extending his hip. The reverse movement is then executed (fig. 82).

Fig. 82.

There first results elongation and consequent stimulation of the calf muscles (with their nerves, vessels, and lymphatics) with passive shortening of the anterior tibial muscles, and then the reverse. If the patient fails to keep his knee fully extended the exercise loses a great deal of its effect, as in that case the points of attachment of the gastrocnemius to the femur and os calcis are approximated.

Stride Sit Kneeling Raising, AR.

The patient assumes the initial position with neck firm, his back being somewhat arched so as to bring the pelvis forwards.

The assistant grasps the patient round the elbows as in drawing backwards (p. 123). The patient then sits down on his lower legs with his trunk erect, effecting this by flexing both thighs and knees, and by straightening the back. The reverse movement is then executed with resistance applied in a backward and downward direction over the front of the elbows (fig. 83).

Fig. 83.

The extensors of the knees, thighs, and spinal column are exercised. The anterior part of the abdomen is alternately elongated and shortened, and thus stimulated. The movement is depletive for the pelvis.

Movements of the Lower Jaw.

These may be prescribed for affections of the muscles connected with the jaw, or for stiffness in the temporo-maxillary joints. Thus in jaw opening, AR, resistance being applied in the middle line underneath the mentum, the following muscles are called into action—digastric, mylo-hyoid, and geniohyoid. In jaw closing, AR., resistance being applied in the middle line over

the mental process, the temporal, masseter, and internal pterygoid are actively contracted ; and so on.

Movements of the Face.

Various active movements may be prescribed in cases of facial paralysis, such as endeavouring to smile, to close the eye, to wrinkle the forehead, &c.

Various movements such as walking, slowly sitting down on a chair and getting up again, standing with the feet together (as in testing for Romberg's symptom), &c., may be prescribed for patients who are suffering from paralysis, disorders of coördination, stiffness of joints, &c.

Subdiaphragmatic Suction.

The patient is placed in half-lying position. The fingers and thumb of the assistant are placed respectively about half way between the umbilicus and xiphisternum about two inches from the middle line. Applying a certain amount of pressure the fingers and thumb, moving as one with the skin of the abdomen, are moved at a fairly slow rate downwards, and then, relaxing the pressure, are brought back again to their original position. The process is repeated for a minute or so.

This exercise is very useful in relieving chronic diaphragmatic spasm.

The following three manipulations are applied to the head :—

(1) Biparietal Movement.

The assistant stands behind the patient and places his hands (lying with their long axes horizontal) so that the palmar aspect of the palms and fingers lies on the lateral parts of the vault of the patient's skull, as in fig. 84 ; then, the patient's scalp moving as one with them, the assistant moves his hands sharply upwards and lightly downwards alternately several times in rapid succession.

The flow in the veins and lymphatics will be promoted from the alternate application and removal of pressure, and from the alternate elongation and shortening of the vessels. The nerves of the scalp will be stimulated.

Fig. 84.

(2) Bitemporal Movement.

The assistant stands behind the patient and places the respective hypothenar eminences of his two hands on the two sides of the patient's skull in the anterior part of the temporal

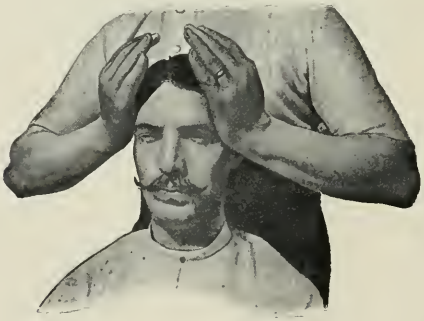

Fig. 85.

fossa, as in fig. 85. He then applies pressure in an inward direction, *i.e.*, he tries to approximate his hypothenar eminences directly towards one another. While doing this he causes his

hands to vibrate, simultaneously performing a circumductory movement with them, the patient's scalp moving continually with his fingers. The direction of the movement is negative as seen from the patient's left, and the circle described is about one inch in diameter.

This manipulation is of great use in dealing with congested or hyperæmic states of the brain and increased intracranial pressure, but the precise anatomical and physiological reasons for the benefits obtained are very difficult to explain.[1]

(3) Occipital Suction Movement.

This manipulation is frequently administered together with head vibration. While one hand of the assistant performs the vibration, the fingers of the other hand are placed over the patient's head, as in fig. 86, p. 221. The scalp moving with them they are drawn sharply downwards and then lightly back again, thus accelerating the venous (and also the lymphatic) flow from the connection between the veins of the scalp and the sinuses in the scalp. As there is an intimate connection between the veins of the scalp and the sinuses in the brain, the latter can be affected through the medium of the former.

[1] *Cf.* Hj. Ling's remarks on "temporaltryckning" in Branting's "Efterlemnade Skrifter," 1882, p. xxii. The popular remedy of relieving headache by pressure on the temples is well known.

SPECIAL MANIPULATIONS OF VARIOUS REGIONS AND ORGANS.

In certain cases when it becomes necessary to treat specially a particular region of the body (such as the head, eyes, arm, &c.), sets of manipulations are often executed in a definite order so as to affect in a given succession the vessels, nerves, muscles, &c., of the part in question. Such sets of manipulations are conveniently referred to under the one comprehensive term "exercise"; thus the term "head exercise" denotes a definite sequence of manipulations.

The descriptions which follow are only intended to outline such sequences. The assistant must not adhere slavishly to every detail, but must use intelligence and discrimination in varying the scheme to suit each patient.

(1) Head.

Sitting Head Exercise, PP.

There are two distinct types of head exercise in common use, between which, however, no hard and fast line can be drawn; the exercise actually administered may be of a kind anywhere intermediate between the two types, as required. In complex cases it becomes necessary to devise a new modification for each patient.

The two types are as follows:—

(A) For cases such as fevers or chronic headache from hyperæmia cerebri, where it is desired to soothe and reduce cerebral excitement. The assistant

(1) Performs head lifting;

(2) Vibrates or works on those parts of the head demanding special attention;

(3) Gives nerve frictions, general, and also local if required;

(4) Repeats head lifting.

The following are the commonest forms of this type of head exercise:—

One hand administers	*The other hand administers*
Double supraorbital nerve friction or vibration, or frontal vibration.	Double great occipital nerve friction.
Coronal suture vibration.	Double second cervical nerve friction.
Sagittal suture vibration.	Occipital suction movement.
Double parietal vibration.	Occipital vibration.

Fig. 86 represents coronal suture vibration, with occipital suction movement; fig. 87 represents frontal vibration with double upper cervical nerve friction.

Fig. 86.

In cases of fever it is generally possible by means of the above type of exercise to cause a hot head to become cool; and in some cases an actual reduction in temperature will result, as can be seen by comparing thermometer readings (from either axilla or rectum) taken just before and after the manipulation. In cases of hyperæmia or congested states of the brain not accompanied by fever, amelioration or even cure may be effected by the same means.

(B) For cases of disseminated cerebro-spinal sclerosis, general paralysis, &c. (a much more stimulatory exercise). The assistant—

(1) Performs head lifting;

(2) Administers strong vibrations with one hand on the sagittal or coronal sutures, while the other hand administers strong frictions on the great occipital nerves;

Fig. 87.

(3) Executes biparietal and bitemporal movements;

(4) Administers strong nerve frictions around the sides of the skull (fig. 88), and in the line of the superior longitudinal sinus; also on individual nerves if required;

Fig. 88.

(5) Administers strong cervical nerve frictions, with pressure vibration on the sagittal or coronal suture;

(6) Repeats head lifting.

The first of the above two types is generally continued for a longer interval of time than the second, for which two to five minutes should suffice.

(2) Throat.

Sitting Throat Exercise, PP.

The assistant—

(1) Performs head lifting;

(2) Keeping the patient's head erect or even a little flexed forwards,[1] with one hand either steadies the head or administers cervical nerve frictions (paying particular attention to the second pair); and with the other vibrates or shakes the submaxillary region, larynx, trachea, inflamed glands, &c., in whole or in part according to the nature and site of the lesion;

(3) Administers frictions on the nerves of the affected part, especially the superior and inferior laryngeal;

(4) Repeats head lifting.

This throat exercise can be administered in a quiet soothing manner, or energetically to be more stimulating, according to the condition of the patient.

Many continental works on massage and gymnastics ascribe to Gerst[2] the credit of having been the first to use local manipulations for the throat. This is, however, quite a mistake. Such manipulations are mentioned in the 1840[3] edition of P. H. Ling's works; and in the 1866[4] edition it is stated that "the (various) parts of the throat can be treated by stroking, pressure, or shaking." Branting[5] in 1842 referred to a local throat movement.

[1] If the head is bent backwards, the omohyoid and sternomastoid compress the internal jugular vein and thus tend to cause congestion of the parts mentioned in (2); *see* page 74.

[2] Gerst's original article on effleurage of the throat was published in "Über den Therapeutischen Werth der Massage" in 1879.

[3] "Gymnastikens Allmanna Grunder" (1834), 1840, p. 160.

[4] *Ibid.*, 1866, p. 530.

[5] Address to the Graduates of the G. C. I. on April 1, 1842.

(3) Eye.

Sitting Eye Exercise, PP.

The assistant--

(1) Performs head lifting;

(2) Vibrates the eye or eyes using either one or both hands;

(3) Administers frictions on the various nerves of the eyelids and orbit, *i.e.*, infraorbital, supraorbital, infra- and supratrochlear, nasal, and the areas in the scalp described on p. 158, first and second cervical sympathetic ganglia, &c.;

(4) Administers a few light vibratory strokings on the upper lids in the direction of the venous flow;

(5) Repeats head lifting.

A head exercise may be added if symptoms point to congestion or other morbid states of that part on which the eye symptoms wholly or partly depend.

All head, throat and eye exercises given for conditions dependent on congestion or hyperæmia, should be followed by derivative movements, especially such as increase the venous return in the internal jugular vein.

I have frequently seen it stated that the treatment of eye disease by local gymnastic methods was originated by Donders[1] in 1872. However, the priority belongs to the Ling school, and probably Branting was the first to use such manipulations in this connection (Hj. Ling[2]). (Although P. H. Ling[3] refers to "light manipulations over the eyebrows" for headache, this does not justify the statement that he ever undertook the treatment of cases of eye disease.) Neumann refers to eye vibration and eye diseases in 1852,[4] 1855,[5] and 1857,[6] and Melicher (a pupil of Branting and Georgii) treated eye disease by gymnastic methods in 1852,[7] 1853,[8] 1854,[9] 1855,[10] 1856 (?), 1857,[11] &c.

[1] Donder's first publication is in *Klinische Monatsblätter für Augenheilkunde*, 1872, p. 302.

[2] Branting's "Efterlemnade Skrifter," 1882, p. xxvi.

[3] "Gymnastikens Allmänna Grunder" (1834), 1840, p. 160.

[4] "Die Heilgymnastik," 1852, pp. 292, 379, 382.

[5] "Bericht über das zweite Jahr des Instituts für Heilgymnastik in Berlin," in *Athenæum fur Rationelle Gymnastik*, vol. ii., 1855, part 3, p. 256.

[6] "Therapie der Chronischen Krankheiten," 1857, pp. 280, &c.

[7] "Erster Bericht über das Institut für Schwedische Heilgymnastik und Ortopædie," 1853, p. 5.

[8] "Jahresbericht für 1853 über das erste Institut für Schwedische Heilgymnastik und Ortopædie zu Wein," 1854, p. 37.

[9] "Jahresbericht für 1854," &c., 1855, p. 21.

[10] "Jahresbericht für 1855," &c., 1856, p. 31.

[11] "Jahresbericht für 1856 und 1857," &c., 1858, p. 38.

(4) Ear.

Sitting Ear Exercise, PP.

The assistant—

(1) Performs head lifting;

(2) Administers vibrations or shakings in the meatus itself, or of the meatus through the tragus, or from behind through the root of the pinna;

(3) Performs shaking of the whole pinna and external meatus;

(4) Administers vibrations or shakings over the mastoid process;

(5) Administers vibrations or frictions on the posterior auricular, great auricular, and facial nerves;

(6) If necessary, administers vibrations or frictions on the glosso-pharyngeal and fifth nerves, and on the second cervical sympathetic ganglia;

(7) Executes running frictions on the scalp in front of, above, and behind the pinna;

(8) Treats the pharynx if necessary;

(9) Repeats head lifting.

Neumann[1] refers to gymnastic treatment for ear diseases, and Melicher mentions cases treated by him in 1852,[2] 1853,[3] 1854,[4] 1855,[5] 1856,[6] 1857,[7] &c.

(5) Upper Extremity.

Sitting Arm Exercise, PP, PA, &c.

(Or PP, PR, AR, if duplicate movements are included.)

The assistant—

(1) Rapidly kneads the muscles of the arm as a whole, with particular attention to parts specially affected;

(2) Administers finger rolling; kneading of any affected joint;

[1] "Lehrbuch der Leibesübungen," 1856, part ii., p. 301; "Therapie der Chronischen Krankheiten," 1857, pp. 287, &c.

[2] "Erster Bericht," &c., 1853, pp. 4, 5.

[3] "Jahresbericht für 1853," &c., 1854, pp. 36, 37.

[4] "Jahresbericht für 1854," &c., 1855, pp. 20, 21.

[5] "Jahresbericht für 1855," &c., 1856, pp. 30, 31.

[6] "Jahresbericht für 1856 und 1857," &c., 1858, pp. 37, 38.

movements at the interphalangeal and metacarpo-phalangeal joints either PP, PA, PR, or AR;

(3) Administers hand rolling; kneading of wrist-joint; movements of wrist-joint either PP, PA, PR, or AR;

(4) Performs pronation and supination either PP, PA, PR, or AR;

(5) Administers elbow-joint kneading; flexion and extension of that joint either PP, PA, PR, or AR;

(6) Administers shoulder-joint kneading, movements of that joint either PP, PA, PR, or AR;

(7) Executes nerve frictions, general or local, on the nerves supplying any affected joints, or paralysed, &c., muscles;

(8) Performs hacking or clapping of the arm as a whole;

(9) Performs arm traction sideways, PP.

It is, of course, hardly ever necessary to carry out all the above, and manipulations specified in (2) to (6) are only necessary in cases where the parts particularly referred to are affected.

(6) Lower Extremity.

Half lying Leg Exercise, PP, PA, &c.

(Or PP, PR, AR, if duplicate movements are included.)

The assistant—

(1) Rapidly kneads the muscles of the leg as a whole, with particular attention to parts specially affected;

(2) Performs toe rolling; kneading of any affected joint; movements of the various joints of the toes either PP, PA, PR, or AR;

(3) Performs foot rolling; kneading of any affected joint in the tarsus and the ankle; movements of such joints, either PP, PA, PR, or AR;

(4) Performs knee-joint kneading; movements of that joint either PP, PA, PR, or AR;

(5) Performs hip-joint kneading; movements of that joint either PP, PA, PR, or AR;

(6) Executes nerve frictions, general or local, on the nerves supplying any affected joints, or paralysed, &c., muscles;

(7) Performs hacking or clapping of the leg as a whole;

(8) Performs leg traction, PP.

(7) Abdomen.

(Exclusive of the genital organs).

Half lying Stomach Exercise, PP.

The patient assumes neck firm half lying position. The assistant sits at the patient's right side, so as to look towards his face, as in fig. 89.

The right hand of the assistant is placed on the front of the patient's abdomen, so that the fingers (which are somewhat

Fig. 89.

separated) lie in its left lumbar region, the thumb (which is abducted) in its right lumbar region, and the palm of the hand in its umbilical and hypogastric regions.

The anterior abdominal wall and the hand of the assistant are then moved as one over the underlying structures. The fingers and thumb should first of all be somewhat flexed, so as to close on the middle part of the abdomen where the small intestines lie ; then the actual movement is carried out in the line of the large intestine in a negative direction as seen from the front, *i.e.*, in the direction of the normal onward passage of the fæcal contents.

The thumb has to apply a certain amount of pressure and travel over the ascending colon and hepatic flexure to the com-

mencement of the transverse colon. This is effected by pronating the forearm somewhat, moving the hand upwards, and then, when the thumb lies in the right hypochondrium, moving the hand upwards and inwards, adducting the thumb at the same time. The fingers, which then lie on the transverse colon, take up the movement; they apply a certain amount of pressure and travel along the large intestine down to the sigmoid flexure. The forearm is therefore somewhat supinated, and the hand travels at first outwards and downwards, then directly downwards, and, finally, downwards and inwards; meanwhile the amount of supination is gradually increased, and the fingers are gradually flexed at their metacarpo-phalangeal joints, so that in the left iliac fossa they lie fairly deep down in the sigmoid flexure.

During the movement on the left side of the abdomen the pressure on its right side is relaxed through the increasing supination, and the thumb is thus brought lightly down into the right iliac fossa. The movement is continued by the forearm being again somewhat pronated, and the hand moving upwards and outwards. Thus the thumb exerts pressure on the right iliac fossa, and is moved up to the right lumbar region, when the manipulation is continued as already described. Meanwhile, the pressure on the left side of the abdomen is relieved in consequence of the pronation of the forearm and extension of the metacarpo-phalangeal joints, and the fingers are brought lightly back to the transverse colon again.

During the whole of this the grasp of the middle part of the abdomen must never be lost; the hand itself describes a small circle and acts chiefly on the small intestines, while the fingers and thumb describe a segment of a large circle and act chiefly along the large intestine. In this way the contents of the abdomen, especially the intestines, are kneaded.

The other hand of the assistant can be placed over the thumb to help it in its onward course.

The above division of the manipulation into separate parts is merely for the sake of description; in reality the various parts should merge into one another evenly and without a break.

Physiological effect of stomach exercise.—The various resulting physiological phenomena are so intimately bound up together that it is impossible either to distinguish them separately or to state definitely how far primary are modified by secondary effects.

Also they vary according to the force and duration of the manipulation. The following are the effects of stomach exercise as ordinarily given in order to act beneficially on the digestive apparatus :—

(1) From the alternate application and removal of pressure, and alternate lengthening and shortening of the vessels, the venous return is hastened in both the portal vein and the inferior vena cava. Unless the exercise be carried out very energetically so as to cause vaso-constriction, there is vaso-dilatation of the arteries of the splanchnic area. As regards the further effect on the latter, it is difficult to generalise, for different cases yield different results. Perhaps this is due to varying degrees of excitability of the vagus and abdominal sympathetic. Vaso-dilatation of the splanchnic arteries is accompanied by a fall in the general blood pressure ; with vaso-constriction the opposite is the case.

(2) There is reflex slowing of the heart ; this arises from almost any form of stimulation of the abdominal viscera (the so-called Goltz[1] phenomenon). It is probably a reflex through the vagus (Goltz). If executed very energetically, however, stomach exercise may cause cardio-acceleration. It is a point of interest that observers are frequently at variance regarding the effect of "abdominal massage" on the heart ; this is no doubt due to differences in the method, strength, and time of the manipulation.

(3) The mechanical application and removal of pressure, together with the improved circulation, stimulates the abdominal viscera, *i.e.*, increased peristalsis results, with consequent increased growth in the muscle of the intestine[2] and stomach proper. This reacts on the venous return. "Peristalsis of the intestine greatly promotes the portal venous flow." (Hill.[3])

(4) There is an increased churning up of the contents of the intestine and stomach proper, brought about partly by increased vital activity in these parts, and partly from the mechanical alternate application and removal of pressure. The contents

[1] *See* "Vagus u. Herz" in *Virchow's Archiv*, 1863, vol. xxvi., pp. 1-33 ; and "Über den Einfluss des Centralnervensystems auf die Blutbewegung.," in *ibid*, 1863, vol. xxviii., pp. 428-432.

[2] Hj. Ling considered that this was partly brought about by reflex action through stimulation of the abdominal parietes. *Cf.* "De Första Begreppen af Rörelseläran," 1866, pp. 62, &c. ; "Förkortad Öfversigt af Allmän Rörelselära," 1880, pp. 18, &c. ; preface to Branting's "Efterlemnade Skrifter," 1882, pp. xxxi., &c.

[3] In Schäfer's "Textbook of Physiology," vol. ii., 1900, p. 121.

of both stomach and intestine will pass on quicker; this will in itself stimulate the intestine to increased contraction.

(5) Improvement takes place in the secretion of gastric and intestinal juice.

(6) Increased absorption by the lacteals results.

(7) The kidneys are stimulated.

(8) The liver is stimulated. This is partly due to reflex irritation from the intestine, and partly to promotion of the portal flow, and partly for the reason given in (3).

(9) Probably the pancreas is affected, the secretion of its juice being improved. (See p. 153.)

(10) The abdominal parieties are stimulated, but only to a slight extent, as they move together with the assistant's hand. Reflex contraction of these muscles, as in phthisis pulmonum, cardiac conditions and intestinal disorders, can, however, be overcome by properly applied stomach exercise at first given gently.

(11) Sometimes there is an effect on the cerebro-spinal system. This effect has as yet hardly received any attention, but in some cases it is quite undoubted. In one case of paralysis agitans I observed that the tremors were entirely suspended during the stomach exercise, to return again at its close. Frictions and vibrations on the abdominal intercostal nerves and abdominal sympathetic produced no such effect.

If the stomach exercise be given very gently, as in cases of acute peritonitis, acute enteritis, &c., which are on the way to recovery, the effects are chiefly as follows:—

(1) The venous return is promoted without a vaso-dilatation ensuing.

(2) Excess of peristaltic action is removed.

(3) Pathological increase in the secretions is diminished.

(4) Pain is removed.

(5) Adhesions are broken down so gently that no irritation results.

(6) Reflex contraction of the abdominal muscles is removed.

Comparison between Kellgren's Stomach Exercise and the "Abdominal Massage" of other Schools.

(1) "Abdominal massage" is frequently administered on the bare skin. This method carries with it the drawbacks of pre-

venting perspiration and probably giving rise to massage eruptions, as in the case of massage of muscles (pp. 211, 212), and also comes into conflict with the objection which exists to uncovering the abdomen in female patients.

(2) "Abdominal massage" is usually executed with a great deal more force, the gymnast's forearm being at right angles to the patient's abdomen, his wrist dorsiflexed as far as possible and his hand dug deep into the abdomen. This is the cause of the frequently mentioned fact that "the first few massage séances are spent in overcoming the reflex contraction and irritation of the abdominal muscles." I myself have hardly ever seen this reflex contraction of muscles excepting in the case of patients especially sensitive to tickling, or, of course, in acute inflammatory conditions of the abdomen.

(3) When performing "abdominal massage," the gymnast is nearly always placed so as to look transversely across the patient's abdomen.[1] Not merely is this position more awkward than the one adopted for carrying out Kellgren's stomach exercise, but the manipulation itself becomes more clumsy and the proper direction of the movement less easy to maintain; it also becomes more difficult to watch the expression of the patient's face, which is one of the best indicators of a tender area being handled.

Lists of the literature on the physiological effects of "abdominal massage" can be found in the books quoted on p. 212.

For Various Organs of the Abdomen.

(Exclusive of the genital organs.)

(1) *Stomach proper.*—Shaking or vibration may be performed with the fingers gently pressed in fairly deeply at the left costal margin anteriorly at about the eighth to ninth ribs; the direction of the manipulation should be downwards and somewhat inwards. Frictions on the sixth to eighth left dorsal nerves near the spine (see p. 164) can be executed simultaneously.

(2) *Liver and gall-bladder.*—These organs may be stimulated

[1] *Cf.* Wide, "Handbok i Medicinsk Gymnastik," 1825, p. 50; "Handbook of Medical Gymnastics," 1899, p. 49; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 47; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 67.

by means of running vibrations or frictions along the lower costal margin of the right side; or the gall-bladder and sixth and seventh right dorsal nerves may be worked simultaneously. One hand attends to the latter, as directed on p. 164, while the terminal phalanges of the third and fourth fingers of the other hand execute frictions downwards and inwards (in the direction of the ducts) at the inner end of the ninth and tenth costal cartilages.

Shaking or vibration of the liver may be performed with the finger tips placed under the right costal margin anteriorly; the manipulation is applied in an upward and outward direction.

(3) *Spleen.*—The fingers are placed under the left costal margin and the frictions are executed directly inwards at the level of the tenth rib. The ninth and tenth dorsal nerves of the left side (see p. 165) can at the same time be conveniently stimulated.

Vibrations over the spleen can also be executed with the fingers placed over the ninth to eleventh ribs in about the mid-axillary line.

(4) *Individual parts of the small or large intestine.*—Frictions, shakings, or vibrations can be executed over any part that is the seat of local pain, distension, &c. The direction of the manipulation depends on the site affected; as a general rule it is in the direction of the progress of the intestinal contents. In some cases of intestinal obstruction, however, it is carried out in the opposite direction, so as to diminish the tension and thereby aid in removing the obstruction.

Vibrations may be executed over any part that is acutely inflamed, either locally or generally. A good example of the former is appendix vibration (see appendicitis).

(5) *Pancreas.*—The fingers of each hand are placed about midway between the umbilicus and the xiphisternum, about an inch from the middle line, and the frictions administered inwards and upwards; clinical experience teaches that this is the best method, although the precise reason has not yet been ascertained.

(6) *Kidneys.*—Frictions or vibrations may be executed transversely across these glands just below the twelfth rib at the outer edge of the erector spinæ. The method of reaching the kidneys from the front has been described on p. 167. If one kidney be treated at a time, one hand manipulates from the front, and the other treats the tenth, eleventh and twelfth dorsal nerves, as described on p. 165.

(7) *Bladder.*—Suprapubic vibration and shaking has been fully entered into already (pp. 168, 169).

(8) *Anus.*—Frictions may be made use of in cases of an incompetent sphincter. It is often useful in these cases to make the patient do rectum lifting, PA, while the frictions are being administered, as follows: the patient must try and draw up his rectum and close the sphincter, thus exercising the muscles that retain control over the fæces. Vibrations of the anus given with the last phalanx of one or two fingers are useful for irritative or inflamed conditions, and for hæmorrhoids.

(9) *Of the anal canal.*—The forefinger is passed in as in the ordinary way for making a rectal examination, and then vibrations are set up. If spasm of the sphincter be present, the finger should vibrate from the beginning of the attempt to obtain its passage; this will generally succeed in overcoming the spasm with the minimum amount of pain.

(8) Genital Organs.

(A) Male.

(*a*) *Prostate gland.*—The patient assumes crook half lying or half lying position, with the knees somewhat separated. The assistant places the terminal phalanx of his forefinger about an inch behind the symphysis pubis and executes vibrations, shakings, or frictions, as the case demands, from behind forwards. That the sympathetic nerves are stimulated is shown by the fact that in some patients a rush of blood to the head takes place, just as in consequence of shaking over the bladder.

(*b*) *Testicle, &c.*—The assistant very gently grasps the testicle from above with the fingers and thumb of one hand, while his other hand grasps it from below. Or he may employ only one hand, and very gently grasp the testicle between the fingers and thumb respectively. He then administers the vibrations. The epididymis, after being very gently grasped between the fingers and thumb, may also be vibrated.

(*c*) *Spermatic cord.*—Vibrations and frictions at right angles to its course may be executed over this structure as it lies in the inguinal canal.

(B) Female.

Disorders of menstruation were treated by P. H. Ling, and a few cases of female pelvic disease were from time to time treated by Branting,[1] Neumann,[2] Melicher,[3] &c. To Thure Brandt,[4] however, belongs the credit of having devised a systematic gymnastic method for treating uterine and ovarian disease.

The following are among the movements most commonly employed by Henrik Kellgren :—

I.—Non-Pregnant.

(1) *Uterus.*

Heave Grasp Standing Suprapubic Kneading, PP.

The patient assumes heave grasp standing position. The operator, sitting on a low stool in front of her and rather to her right side, places the left hand over the sacrum to steady the patient, and the right hand over the lower part of the abdomen, so that the proximal part of that palm rests above the pubis and the rest of the hand over the hypogastric region, with the fingers pointing directly upwards. The fingers and thumb are then somewhat flexed, and the thumb and little finger somewhat opposed. Thus the lower part of the abdomen, and with it, of course, the uterus, is grasped in the hand. Then, continually applying a certain amount of pressure upwards, so as to lift this part, a series of circular movements is made in a negative direction as seen from the front, with alternating application and removal of lateral pressure from the thenar and hypothenar eminences.

This exercise promotes the circulation in the uterus and pelvic organs as a whole. It also tends to correct pendulous abdomen. The bladder is sometimes stimulated to contraction, resulting in a desire for micturition.

[1] *See* gymnastic prescriptions in "Efterlemnade Skrifter," 1882.

[2] "Therapie der chronischen Krankheiten," 1857, p. 213.

[3] "Erster Bericht," &c., 1853, pp. 4, 5; "Jahresbericht für 1853," 1854, pp. 35, &c.; "Jahresbericht für 1854," 1855, pp. 20, &c.; "Jahresbericht für 1855," 1856, p. 30; "Jahresbericht fur 1856 und 1857," 1858, pp. 36, &c.

[4] The following are the chief works of Thure Brandt :—"Om Behandling af Uterinlidanden och Prolapser med Medikal Gymnastik," 1864; "Nouvelle methode gymnastique et magnétique pour le traitement de maladies des organes du bassin et principalement les affections utérines," 1868; "Massage bei Frauenleiden (Behandlung weiblicher Geschlechtskrankheiten)," 1890, 1893, 1897.

For all the following movements the patient is to be placed in half lying or crook half lying position.

(*a*) External Treatment.

Suprapubic uterine frictions.—In some cases the uterus can be stimulated to contraction by executing frictions at the side of the symphysis pubis about two inches from the middle line.

Uterine vibrations through the abdominal wall.—The tips of the fingers and thumb are placed over the uterus, grasping it if convenient, and then vibrations are set up.

Uterine frictions through the abdominal wall.—May be executed with the fingers in the hypogastric region over the uterus in a direction from above downwards.

Bimanual uterine lifting through the abdominal wall.—The operator stands at the patient's head and looks towards her feet. The hands are then gently pressed in on either side in the iliac fossæ low down, in an inward and downward direction, until the fingers close on the lower part of the uterus. They then lift that organ in an upward and forward direction. This lifting may be carried out with simultaneous vibration.

(*b*) Internal Treatment.

It isi mperative that all cases of internal treatment be handled only by a very skilled operator and in such a way as to cause absolutely no sexual excitement.

Uterine vibration (internal).—The forefinger is passed in the usual way into the vagina until it touches the cervix and is then set into vibration.

Uterine frictions (external) with uterine vibration (internal).—In cases of obstinate chronic inflammatory conditions of the uterus or leucorrhœa from that organ, these two manipulations can be combined.

Uterine lifting (internal).—The forefinger of one hand is passed in in the usual way, and when it has reached the cervix is gently pushed up, vibrating all the time, so that the cervix (and with it, of course, the uterus) is lifted upwards. The other hand may be used if necessary through the anterior abdominal wall to guide the uterus in its course and prevent displacement.

In cases of bad prolapse with or without inversion, the procedure is practically the same, *i.e.*, gently lifting up the protruding parts with simultaneous vibration. This should be supplemented by strong frictions on the posterior sacral nerves and on the subtrapezial plexus.

Repositions of malplacements of the uterus.—No special directions can be given, as each case must be treated according to its nature. Simultaneous vibration of the manipulating hands often facilitates the replacement of this organ.

(2) *Ovaries.*

Frictions[1] *on the ovaries.*—The patient assumes the half lying position. The palmar surfaces of the distal parts of the fingers of both hands are placed respectively one on each side of the abdomen about two inches internal to and two inches below the anterior superior spine. Then, generating the movement almost exclusively from the metacarpo-phalangeal joints, and keeping the joints of the fingers extended, the frictions are gently executed in a direction downwards and inwards.

Vibrations on the ovaries can be executed with the fingers placed over on the same spot as for executing frictions.

There is no reason why the treatment should be discontinued during the menstrual period; on the contrary, in most cases it is better to continue with it during that time. Exercises of an exerting nature or that draw blood from the pelvis (excepting in cases of menorrhagia or metrorrhagia) can be omitted; but the rest of the daily treatment should be carried out as usual. It is noteworthy that female patients, when under the manual treatment, often show greater improvement just after menstruation than during the rest of the previous month. I have personally verified this even in cases of such diseases as chronic adhesive pleurisy and facial paralysis, which it might be imagined would be unaffected by menstruation. This tends to show that the flow can act as a general eliminator in conditions apart from pelvic disorders.

[1] "Frictions" is not really a good term, as the movement is in most cases a very gentle one, but there is no better word to replace it. In atrophic conditions of the glands, however, as in premature menopause, the manipulation is executed more energetically and in reality becomes "frictions."

II.—Pregnant.

Respiratory exercises and trunk movements carried out during pregnancy in order to promote the abdominal circulation and strengthen the muscular walls of the abdomen[1] will often have a very beneficial effect on the patient. Such exercises as loin lean stride standing alternate rotation, AR, ringing, PP; sit lying back raising, PA, &c., are very suitable, and I have never known them to cause the slightest symptom of threatening abortion—on the contrary, in conjunction with other manipulations, they can sometimes counteract the abortive habitus. In such cases the amount of resistance or force applied should, of course, be moderated somewhat, and during the course of all the above exercises the patient must draw her abdomen upwards and inwards as much as possible.

Stomach exercise, given with a moderate amount of energy, may be administered to all pregnant patients without danger of abortion. It should, however, in cases of abortive habitus or where symptoms of pelvic pressure are manifested, be supplemented by the so-called "uterine lift-vibration" (see p. 139) as follows: The patient assumes the half lying position; the operator places his hand very much as for suprapubic kneading (see p. 234), so that his thumb and fingers gently close on the lower part of the uterus. Pressing gently upwards with the proximal part of his palm, the fingers are slightly approximated, and then lift the whole uterus upwards; they then vibrate that organ for one to five minutes. In one case of threatening abortion at the sixth month, with uterine "pains," in a patient who had continually been having miscarriages ever since her first confinement twenty years previously, this uterine lift-vibration given at intervals for about an hour, stopped the uterine pains and prevented abortion. This movement, together with other trunk and leg exercises, was performed daily, and at the ninth month a normal confinement took place with satisfactory issue.

III.—During Labour.

Frictions on the posterior sacral nerves (especially the third and fourth) and on the lumbar nerves, executed during each

[1] *Cf.* Georgii, "Kinetic Jottings," 1880, p. 87.

uterine pain, seem to aid materially in the expulsion of the fœtus and afterwards of the placenta; they certainly diminish the pain in the back that is so often present, and make the patient feel more comfortable. Strong vibration on the coronal suture during the pains has in many cases a stimulatory effect.

IV.—Post-partum and Puerperium.

As soon as possible after the expulsion of the fœtus stomach exercise should be given, alternating with uterine suction vibrations or friction vibrations with suction, given with the hand placed over the fundus. In cases of inertia uteri or post-partum hæmorrhage, frictions on the posterior sacral nerves and on the uterus itself can be used simultaneously. If these fail to stop the hæmorrhage, the latter can sometimes be arrested by passing the fingers of both hands deep into the abdomen at the side of the uterus just above the symphysis pubis and setting up very strong vibrations or shakings.

For the first week or so after the confinement, stomach exercise, uterine suction vibrations or frictions and spinal nerve frictions (especially sacral and lumbar) should be administered morning and evening. During the second and third week they need, as a general rule, be only administered once a day. About the fourth day after the confinement, *i.e.*, when the danger of puerperal fever is over, the patient, if otherwise strong and healthy, should be encouraged to get up and move about, and one or two mild trunk movements may be performed in order to exercise the anterior abdominal muscles and to promote the abdominal circulation, *e.g.*, sit lying back raising, PA, (with assistance if needed).

The recumbent position during the puerperium has always been advocated by the profession chiefly for the following reasons :—

(1) To enable the patient to regain strength.

(2) To prevent prolapse and displacements.

(3) To enable the abdominal muscles to recover their tone.

(4) To enable the uterus to return to its proper size.

(5) To prevent the entrance of septic matter.

In Kellgren's methods the reasons for preferring gymnastic exercises are as follows :—

(1) The patient is enabled to regain strength by exercising the

muscles of her body as a whole. Voluntary muscles do *not* gain strength by being kept in a state of prolonged rest after the effects of the fatigue of the actual labour have passed away.

(2) Prolapse is prevented by the strengthening of the pelvic and abdominal muscles through passive manipulations such as stomach exercise and uterine and sacral nerve frictions, and, what is far more important, through active exercises in which the patient has to use her own powers to contract these muscles and improve their tone. In cases where there is a tendency to backward displacement, prolonged rest in bed will, instead of preventing such a malposition aid in its establishment, as then the force of gravity acts continually on the uterus, tending to draw it towards the sacrum.

(3) The uterus is better enabled to perform involution to the correct amount through movements carried out to promote the venous and lymphatic return (and thus getting rid of the waste products) and through stomach exercise and other manipulations carried out to stimulate it to contraction, than by keeping the patient in a position of rest by means of which a tendency to venous and lymphatic stasis and hypostatic congestion is produced.

(4) The entrance of septic matter is prevented just as easily with the patient up and walking about; and the danger of its obtaining a foothold in the case of entrance into the uterus is much less when the uterus is in a healthy active condition than when it is inactive through prolonged rest.

An exercise often prescribed as a general tonic is known as

Forwards Lying Back Exercise, PP (and PA).

The patient assumes the forwards lying position. The assistant—

(1) Executes head to foot running nerve frictions;

(2) Performs length hacking;

(3) Administers a rapid stroking, only once, on the posterior aspect of the body from shoulder to heels.

The assistant's manipulations being ended, the patient performs back arching, breathing, PA.

CHAPTER VI.

CONCLUDING REMARKS TO PART I.

I HAVE now briefly described the more important exercises and manipulations as practised by Henrik Kellgren. It is, however, possible to vary them infinitely; they may be specially modified and adapted to each particular case in order to produce the maximum beneficial effect. This has already been specially insisted on in more than one instance. In some cases it may become necessary to alter exercises so much that the process practically amounts to inventing new ones. As a general rule, passive movements lend themselves far more conveniently to modification than duplicate ones, especially such complex forms as head exercise, stomach exercise, &c. Experience alone can enable the assistant to suit these movements to each patient, and to adapt them day by day to his progress.

Modifications may be made as regards:—

(1) The initial position. The greater the difficulty of assuming the initial position, the less can the patient concentrate his energy on the actual movement performed from it. This may or may not be of advantage. When patients are confined to their beds all movements are, of course, given to them while they are in lying, half lying, side lying, or sitting positions; in acute cases the patient may be allowed to occupy whatever posture is most comfortable, provided it neither impedes the administration of the actual manipulation nor impairs its beneficial effect. The rule that all initial positions must be carefully and correctly assumed and maintained during the whole performance of a movement from beginning to end may in such cases be suspended. Deviations from the same rule are also permitted when certain passive movements are administered to a patient occupying lying or sitting positions, *e.g.*, there can be no objection to letting a patient change the position of a foot for comfort's sake during the time that he is undergoing a lengthy head exercise.

(2) The energy with which passive movements are given, or with which the opposing force is offered in duplicate movements.

(3) The rapidity with which a movement is performed.

(4) The frequency of repetition, or period of application (in active and passive movements respectively).

(5) The length of the pause between the repetitions.

(6) The order of arrangement of the exercises in the daily programme. For example, two consecutive exercises which call the same muscles into action will be more tiring than if separated by movements involving other muscles.

(7) The administration of two or more passive manipulations simultaneously.

(8) The withdrawal or reversal of direction of the whole or part of the resistance; *e.g.*, ride sitting arm abduction AR, adduction PR, exercises the abductors; but if given as abduction PR, adduction AR, the antagonists (adductors) are exercised. As an example of possible variations I may specify the following: half lying foot flexion and extension (already described on pp. 69, 70).

Flexion.	Extension.	Flexors.				Extensors.			
		Passive.	Purely active.	Duplicate concentric.	Duplicate eccentric.	Passive.	Purely active.	Duplicate concentric.	Duplicate eccentric.
PP.	PP.	×	—	—	—	×	—	—	—
PP.	PA.	—	—	—	—	×	×	—	—
PP.	AR.	—	—	—	—	×	—	×	—
PP.	PR.	—	—	—	×	×	—	—	—
PA.	PP.	×	×	—	—	—	—	—	—
PA.	PA.	—	×	—	—	—	×	—	—
PA.	AR.	—	×	—	—	—	—	×	—
PA.	PR.	—	×	—	×	—	—	—	—
AR.	PP.	×	—	×	—	—	—	—	—
AR.	PA.	—	—	×	—	—	×	—	—
AR.	AR.	—	—	×	—	—	—	×	—
AR.	PR.	—	—	×	×	—	—	—	—
PR.	PP.	×	—	—	—	—	—	—	×
PR.	PA.	—	—	—	—	—	×	—	×
PR.	AR.	—	—	—	—	—	—	×	×
PR.	PR.	—	—	—	×	—	—	—	×

From the very nature of Swedish medical gymnastics various persons have argued that it would be possible to devise mechanical

appliances,[1] which, if constructed with weights and levers for the active movements, and furnished with an engine to supply the motive power for the passive ones, would advantageously replace the assistant's hands in administering the exercises; and during the last fifty years such machines have been invented and constructed. They have gained great popularity amongst a certain class of gymnasts, chiefly on account of the following reasons:—

Firstly, no manual skill is required on the part of the gymnast; secondly, the gymnast saves himself fatigue and expenditure of time; and, thirdly, he can have many more patients under his care at once. All these conditions are advantageous to the manipulator, but the reverse to the patient, as the following considerations will show:—

(1) Machines can only partially adapt themselves to differences in the size, adiposity, &c., of different patients.

(2) They cannot adapt themselves to the daily variation of each individual patient.

(3) They cannot encourage the patient by admonishing him to do his best.

(4) They cannot by themselves regulate the specific rate of the movement.

(5) They cannot prevent the patient from turning a passive movement at a joint into an active one.

(6) Only a limited number of initial positions are permitted by them, and only a limited number of movements can be executed by them.

(7) They cannot administer an exercise that involves pain for many days running, as the patient will (even insensibly) adopt some means of nullifying it, such as a faulty position, or a wrong muscular action.

(8) Some exercises can under no circumstances be executed by a machine; the human hand, guided by the human brain, is often the only possible agent of manipulation. No machine has yet been constructed capable of correctly giving such complicated and varying movements as stomach exercise or arm nerve frictions (on the deep lying trunks); I think I may add that no such machine will ever be produced.

[1] Under mechanical appliances I do not, of course, include such apparatus as couches, chairs, horizontal bars, &c., which are used to enable the patient to assume different initial positions, and also for isolation or steadying purposes.

(9) They cannot observe in the patient changes for the worse, or new symptoms pointing to complications, &c., and then act accordingly.

(10) They cannot apply traction and graduate it to suit each patient.

(11) The question of manual *v.* machine vibrations has been discussed on pp. 182, 183.

The G. C. I. never employs machines to replace the manual method, and Branting,[1] Hj. Ling,[2] Georgii,[3] Th. Brandt,[4] and Hartelius[5] always considered the latter method the superior one. An exception might possibly be made in the case of vibrations and shakings; P. H. Ling,[6] Branting,[7] and Hartelius,[8] say that machines may be used to administer these manipulations instead of the hand. I cannot acquiesce in the statement that P. H. Ling on several occasions declared that machines might be constructed to perform certain active exercises hitherto executed manually, as is implied by Zander;[9] the latter, however, confesses that it depends upon verbal evidence only. No machines of any description were used when I was a student at the G. C. I.

I need scarcely add that Kellgren's treatment rigidly excludes *all* such mechanical appliances; it relies solely on the skilled hand governed by the intelligent brain.

I wish to take the opportunity of stating that it is utterly impossible for anyone to learn this treatment by reading descriptions of the movements and watching trained students execute them. A tyro might as well expect to become an expert performer on the piano or violin by learning the theory and watching the performances of professionals. Several years are necessary, even for those with natural talent, both mental and manual, to gain a thorough mastery of the technique of the various move-

[1] Address to the graduates of the G. C. I., April 1, 1842.

[2] "Förkortad Öfversigt af Allmän Rörelselära." 1880, p. 97.

[3] "Kinetic Jottings," 1880, pp. 102, 103, 134-137.

[4] "Massage bei Frauenleiden," 1897, pp. 19, 20.

[5] "Gymnastiska Iakttagelser," 1863, pp. 50, &c.; "Den Manuella Metoden och Maskinmetoden inom Sjukgymnastiken," in *Hygeia*, June, 1873.

[6] "Gymnastikens Allmänna Grunder," 1866, pp. 581, 585.

[7] "Efterlemnade Skrifter," 1882, pp. 167, 168.

[8] "Lärobok i Sjukgymnastik," 1883, p. 103; 1892, p. 101. *See* also Murray, Levin, Thure Brandt, &c., in Liedbeck, "Vibratorn, dess Ändamål, Beskrifning och Användning," 1891, p. vi.; English translation, 1891, p. vi.

[9] "Svar på 'Några ord till belysning af frågan om de tvenne olika gymnastikmetoderna, den mannella och den mekaniska,'" 1872, p. 5.

ments. But there is also a great deal to learn over and above the actual technique. Capability of judging the proper duration of an exercise and of knowing what movements are best suited to the particular case is essential, as is also practical experience in knowing what effects can or cannot be obtained. In serious cases insufficient knowledge and judgment may prove as dangerous as in any other branch of medical practice.

No amount of mere theory can ever teach one the practical part; to achieve the proper standard of executive capacity requires long and patient experience. He who shirks the latter will merely become a gymnastic machine that will never attain the requisite skill. In addition, after having reached a certain level, he will in all probability fail to maintain it, and his treatment will degenerate accordingly.

It has lately become fashionable amongst some medical men, who consider that the actual practice of gymnastics is quite beneath their dignity, to confine their attention to making out the diagnosis of their cases and writing the gymnastic prescription, leaving the administration of the movements to others. This can only have one result, namely, that any skill they may have attained to degenerates, and that they lose their sensibility of touch and the power of estimating by feeling the condition of the patient. This tendency of the present day may to some extent account for the variety of misinformation and number of errors which abound in books on massage and gymnastics.

PART II.

PRACTICAL APPLICATION OF THE TREATMENT, ILLUSTRATED BY CASES.

PREFACE.

I shall now proceed to consider the practical application of Kellgren's manual treatment, illustrating my remarks from clinical experience. In each of the cases quoted (unless specially mentioned) Kellgren's treatment was the only therapeutic agent employed, and in consequence the specified beneficial results were due entirely to the merits of that method as opposed to any other.

I have definite reasons for describing so many cases in great detail. Frequent and recurring enquiries are made by medical men who have interested themselves in Kellgren's treatment as to the disappearance of or change in one particular symptom of a disease under cure. Further, the rapid course that acute ailments take under Kellgren's treatment is of extraordinary interest, and calls for detailed account; it is, indeed, not too much to say that some of the results to be obtained will cause a revolution in the hitherto ordinarily accepted ideas concerning symptoms, duration, prognosis, sequelæ, and mortality.

With regard to some cases, the principles on which the gymnastic prescription depends is explained at length; with regard to others, however, the gymnastic prescription is left to explain itself in the light of what has already been said.

The cases themselves are nearly all from my own private practice, and they date from July, 1898, to December, 1902. Most of them occurred while I was in practice at Sanna, which is situated about two-thirds of a mile from the town of Huskvarna, and about three miles from the town of Jönköping, in the province of Småland, in Sweden.

CHAPTER I.

DIAGNOSTIC EXERCISES.

Diagnostic exercises are mentioned in the writings of P. H. Ling,[1] Neumann,[2] Richter,[3] Hj. Ling,[4] and others.

Active exercises may be used :—

(1) To diagnose stiffness or adhesions ;

(2) To determine the cause of pain, whether local or reflex ;

(3) To diagnose paresis or paralysis of groups of muscles or individual muscles ;

(4) To determine coördinating or inhibiting power ;

(5) To diagnose spastic conditions, and determine the presence or absence of tremor ;

(6) To settle various points in connection with irritability of the heart, power to control prolapsus uteri, herniæ, the efficiency of the respiratory function, &c. ;

(7) To determine the state of voluntary muscle action as controlled by the intelligence in persons who are imbecile or mentally deficient ;

(8) To determine the causes that have brought about deformity, such as malposition, occupation, &c.

Passive movements at joints may be used to determine :—

(1) The degree of mobility at a joint ;

(2) The looseness or weakness of a joint ;

(3) Whether pain is local or reflex ;

(4) The presence of spastic conditions ;

(5) The degree of extensibility of various muscles ;

(6) The presence of adhesions, stiffness, crepitus, &c.

[1] "Gymnastikens Allmänna Grunder," 1834, 1840, pp. 69, 154, 171, 172 ; *ibid.*, 1866, p. 536.

[2] "Therapie der chronischen Krankheiten," 1887, pp. 32, &c.

[3] "Bericht über neuere Heilgymnastik," in Schmidt's *Jahrbücher*, 1854, vol. lxxxii., pp. 260-264.

[4] "De Första Begreppen af Rörelseläran," p. 1866, 164 ; "Förkortad Ofversigt af Allmän Rörelselära," 1880, p. 84.

Nerve vibrations and frictions may be used to determine :—

(1) Whether pain is local or reflex ;

(2) The degree of the motor response ;

(3) The degree of the sensory response ;

(4) The degree of the vasomotor response ;

(5) The condition of efficiency as regards various reflex functions of nerves, such as vesicomotor, cardiomotor, &c.

In a similar manner the same movements may be used for prognostic purposes.

The use of the sense of touch as an aid to diagnosis. This method has been systematically developed by Henrik Kellgren, though up to the present there exists no literature on the subject.

The ability to properly employ this method can only be acquired through years of practice ; it cannot be acquired theoretically. Long experience is indispensable, presupposing a certain amount of general natural aptitude for applying Kellgren's treatment, which latter gradually develops in every administrator a great delicacy of touch.

It is exceedingly difficult to provide a description of this method which shall be intelligible to those who have not had the opportunity of actually employing it ; I will, therefore, limit myself to the following remarks. When executing such a manipulation as head or stomach exercise, a trained hand at once recognises very slight abnormal fulness, pulsation, fluctuation, heat, stiffness of muscles, &c. But sometimes, even in the absence of definite abnormalities, the assistant is cognisant through his touch that the part under manipulation does not feel perfectly healthy. This part is then treated until the trained hand either feels that the part is once more normal, or else that no more can be done for it for the time being.

It is difficult to overrate the usefulness of the sense of touch in this connection. It also frequently enables the operator to determine which parts of the patient need special treatment, and also how long such parts should be manipulated ; and finally it is often successful where other methods fail entirely.

CHAPTER II.

GENERAL PRINCIPLES IN THE APPLICATION OF THE MANUAL TREATMENT.

THE object of the manual treatment is to replace pathological conditions by physiological ones.[1] This is effected by executing movements in physiological harmony with the requirements of the particular case, as follows—

I. Local treatment over the specially affected parts.

II. General treatment, by which is meant treatment of the constitution as a whole.

The reasons for the former are obvious enough, but the reasons for the latter are not so widely understood; and in fact the modern practitioners of Ling's system in a great many cases only treat locally. Treatment of the patient's constitution as a whole should, however, always form part of the remedial course, however local be the pathological condition. There are several reasons for this :—

(1) Normally there are a great many toxins and waste matters in the general circulation, but no harm results, as the body by means of vital chemical changes and natural power of resistance is able to reject them; but should it become unable to do so, then disease, either general or local, sets in. By treating the constitution, however, steps are taken towards restoring or retaining this power of elimination.

(2) Any local lesion will itself in the course of time become a source of production of toxins and waste matters other than those just referred to. These new products will tend to lower the vitality, and should the body fail, as it were, to "rise to the occasion," then the constitutional symptoms may become very severe, and if not checked the result may be fatal. Even if the

[1] *Cf.* Neumann, "Das Muskelleben das Menschen in Beziehung auf Heilgymnastik und Turnen," 1855, p. 21.

body is able to throw off these toxins, &c., a considerable effort will be required, and in either case the manual treatment will materially assist the process of elimination.

(3) If there is a tendency for waste products to accumulate, these will tend to do so in the weakest parts of the body, *i.e.*, those which have the least physiological power of resistance; thus such parts must be continually stimulated in order to avoid their becoming secondarily affected.

(4) The actual cause of the disease may be overlooked, should general treatment be omitted. As an example I may take spinal curvatures. These may be due to a tender or irritative condition of some internal organ, such as an ovary or kidney; deformities in the vertebræ will arise in the course of time from the reflex contraction of muscles over these parts. These causes are usually not mentioned in the literature on spinal curvatures,[1] they are, however, very important indeed. To simply treat the deformity without attacking the cause will, of course, only yield a very slightly beneficial result, if indeed any at all. The experience of Henrik Kellgren tends to show that the cause of many affections in peripheral parts is more often to be found in diseases of the internal organs than is generally supposed.

The manual treatment, local and constitutional, greatly increases the physiological power of resistance, both locally and generally. This is a very important factor in the cure, especially as the curative influence is not purely external; it is endeavoured to render the patient himself the source of remedy. It is of paramount importance to develop the active elements in the patient, however weak and feeble at first, by getting him to use his own muscles, his own nerves, his own brain. The first sign of his beginning to use these is the first sign of returning power of resistance to disease; it must be remembered that a cure does not commence with the first application of treatment (external assistance), but with the moment that the patient's body begins actively to lend support towards the result that the treatment is striving to obtain (internal co-operation).

[1] Wide, who is considered a specialist on spinal curvatures, does not mention them in his handbooks.

CHAPTER III.

SPECIFIC INFECTIOUS DISEASES.

The experience of the Ling school has tended to show that acute fevers, whether specific infectious or otherwise, do not enter into the sphere of medical gymnastics. There have been a few successful efforts, such as Branting's [1] case of acute pneumonia, but on the whole the Ling school condemns attempts to apply gymnastic manipulations to such conditions (*cf.* P. H. Ling,[2] Georgii [3]). Wide [4] is, of course, opposed to gymnastic treatment for acute specific infectious diseases.

In applying Kellgren's treatment to acute specific infectious diseases the following are the objects in view:—

(A) During the Acute Stage.

I.—To improve the local condition or conditions, and thereby raise the local power of resistance. This is effected by:—

(1) Promoting the circulation both of the blood and lymph, and causing vaso-constriction of over-dilated arteries, by means of passive manipulations such as vibrations, shakings, frictions, nerve frictions, &c., and occasionally by means of passive movements of joints.

(2) Raising the nervous functionability by stimulating the nerve trunks by nerve frictions.

II.—To diminish the constitutional disturbance by raising the power of resistance of the body as a whole, and thus also presumably aiding in the process of the natural antitoxin formation.

[1] See p. 311.

[2] "Gymnastikens Allmänna Grunder" (1834) 1840, pp. 180, 181.

[3] "Kinetic Jottings," 1880, pp. 166, 206.

[4] "Handbok i Medicinsk Gymnastik," 1896, p. 149; "Handbook of Medical Gymnastics," 1899, p. 148; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 139; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 156.

This is effected by means of the so-called "general treatment for fever," which is executed so as to :—

(1) Diminish cerebral excitement ;

(2) Stimulate the nervous system as a whole ;

(3) Quiet the circulatory disturbances ;

(4) Stimulate the organs that bring nutrient matter to the body ;

(5) Stimulate the assimilatory organs ;

(6) Stimulate the excretory organs ;

(7) Stimulate the spleen.

This so-called "general treatment for fever" comprises :—

(1) Head exercise ;

(2) Spinal nerve frictions, especially cervical ;

(3) Heart vibration or shaking ;

(4) Side shaking, and inducing the patient to take a few deep respirations ;

(5) Stomach exercise ;

(6) Kidney vibration or friction ;

(7) Spleen vibration or friction ;

(8) Vibration or shaking over the bladder (usually).

Regulations as to diet and rest in bed.—I have never imposed the slightest restriction on diet, but, on the contrary, have always allowed my patients (when I have had the case in hand from the beginning) to act in this respect exactly as they wished, and I have never had the slightest cause to regret this procedure. It seems that Kellgren's treatment greatly assists the powers of assimilation, and this is a powerful factor in keeping up the patient's strength and cutting short the disease, &c. I have likewise almost invariably allowed my patients to get up if they wished to, provided that the room was warm and they were kept from draughts, except in cases accompanied by delirium, when I have endeavoured to keep my patients quiet in bed. I must not be misunderstood in this respect ; the profession must not believe that I *make* my patients eat heartily and *make* them get up ; I merely leave them to act on the dictates of Nature, whom I regard as the best judge under the circumstances.

I consider compulsory prolonged rest in bed a powerful factor in reducing the vitality as a whole, in aiding general venous stasis, and in promoting hypostatic congestion, especially of the kidneys, all of which are the very conditions to be avoided.

(B) During the Convalescent Stage.

The treatment during the convalescent stage, having more or less different objects in view, is different from that administered during the acute stage. It may be conveniently termed "general treatment for convalescence." Its objects are as follows:—

(1) To stimulate the organs or parts that have been the seat of any local lesion.

(2) To improve the constitution as a whole by means of circulatory and respiratory exercises, movements to stimulate the assimilatory and excretory organs, and stimulatory nerve manipulations. Purely active and duplicate exercises should be given as soon as possible.

From a clinical point of view the following are the chief results obtainable in the majority of instances by applying Kellgren's treatment to cases of fever:—

(1) Delirium is prevented, or removed if present.

(2) The general condition of the patient is improved there and hen, nearly always from a subjective, and frequently from an objective point of view.

(3) Pyretic and hyperpyretic temperatures are lowered, sometimes at once, sometimes an hour or so after the conclusion of the treatment.

(4) The progress of the disease is cut short.

(5) Complications are reduced to a minimum.

(6) Convalescence is hastened.

(7) Sequelæ are prevented.

(8) The cure is absolute and permanent; in some cases the patients will continue in much better health after the disease has passed than they had enjoyed for many months preceding. (See appendix.)

In any of the fever charts appended, if two points are marked in the same temperature column, they represent the temperature immediately before and immediately after the treatment. Two figures in the pulse column mean the same as regards the pulse.

Typhoid Fever.

C. G., male, aged 24, came under the manual treatment on March 30, 1902.

Previous history.—Quite good.

History of present illness.—He believed he caught a chill on March 20, which manifested itself in general weakness, fatigue, and headache. His condition remained unchanged during the ensuing week; during this time, however, he did not feel so unwell as to be obliged to cease work at the Huskvarna iron factory. During the evening of March 28 he was suddenly seized with pains in the legs and chest, which were so severe that he had at once to go to bed. A masseur was called in, who administered massage on the painful areas without improving matters. March 29.—Morning. Condition about the same; patient in bed all day. More massage administered. Evening. Condition worse; pain chiefly in abdomen. "Abdominal massage" made him still worse. March 30.—Morning. During the night patient felt very ill; had violent attacks of abdominal pain, and slept very badly. No motion since March 27. An attempt to administer "abdominal massage" failed on account of the pain induced, and I was called in.

Examination.—March 30, 2 p.m. The patient looked feverish, and was lying in bed with his legs drawn up. He complained of continued severe pain in the right side of the abdomen; any attempt at movement or at straightening his legs made it worse. Occasionally there were acute exacerbations of the pain. The appetite was very poor; only bread and butter and milk had been consumed during the last three days. There was a good deal of eructation, but no vomiting; and no motion had taken place that day. The respiration was entirely thoracic; any attempt to use the abdomen in breathing caused severe stabbing pains in that region. The anterior abdominal muscles of the right side were firmly contracted; those of the left side partially contracted. Great tenderness to pressure existed on the right side, some also on the left. Deep palpation of the abdomen was impossible. The patient had his first and only rigor the same morning. (For temperature and pulse see separate chart, fig. 90. *Cf.* effect of treatment with ordinary records.)

After treatment the patient could stretch his legs without discomfort, and the pain in abdomen was lessened; he could also to a slight extent use his abdomen for respiration without extra pain.

Evening. Condition about the same. No motion. Treatment repeated.

Treatment henceforth administered twice a day.

March 31.—Morning. Patient had slept fairly well. Pain less. Patient felt like having a motion, but failed to induce one.

Evening. Motion, normal in appearance, at 2 p.m.; thereafter a good deal of pain in the abdomen, which, however, soon passed off. Patient sat up most of the afternoon. General condition otherwise about the same.

April 1.—Morning. After breakfast (8 a.m.) some severe pain, which, however, soon disappeared. 11 a.m. Pain in abdomen much less than yesterday; contraction of abdominal muscles present, but considerably diminished by treatment. Deep palpation of the abdomen was possible for the first time, and by its means I could feel that the right iliac and right lumbar

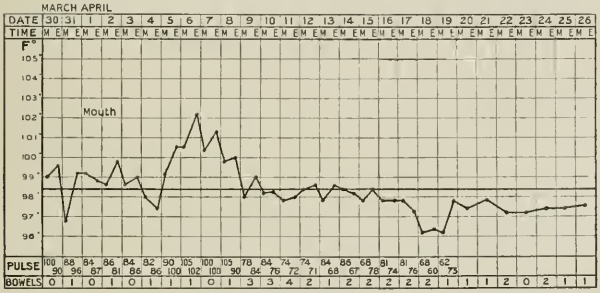

Fig. 90.

regions were filled up by a large, softish, boggy mass, very tender to touch. On executing vibrations over it, gurgling sounds were heard and felt.

Evening. About the same. No motion during the day.

April 2.—Motion, apparently normal, during the morning; after it some pain. Appetite better; patient, who had been living for the last week on bread, butter, and milk, ate some fish.

April 3.—Contraction of abdominal muscles still less. Appetite better. Patient up during the greater part of the day in an arm-chair; walked about at intervals. Pulse markedly dicrotic from to-day onwards during the following week.

April 4.—Motion, apparently normal, during the morning. The large mass in the abdomen was smaller and less tender.

Patient up all day. Appetite, however, not quite so good as during the previous day.

April 5.—Rise of temperature. Patient rather worse, but able to sit up all day in an arm-chair. In the evening I was told that patient had had a foul-smelling, yellowish-green diarrhœic motion, after which there was very much abdominal pain. I did not see the motion, as it was thrown away at once.

April 6.—Morning. Further rise of temperature. Patient looked and felt worse. He was able to sit up in an arm-chair until 2 p.m., but then felt so ill as to be obliged to go to bed. 3 p.m. Pain in abdomen worse; more contraction of abdominal muscles. At 5 p.m. attack of epistaxis.

Evening. Condition still worse. Diagnosis of typhoid fever rendered positive. A culture taken from the next motion revealed the characteristics of typhoid bacilli, and not those of bacillus coli communis. Patient apathetic; did not speak unless spoken to first; answered questions slowly and sadly. Cheeks flushed, eyes bright; typhoidy appearance of face. Pupils dilated. Tongue coated, redness of fauces. He "lies low in bed," constantly on his back. More pain and tenderness in abdomen, specially in the right iliac and right lumbar regions; marked swelling of the right side of the abdomen. Spleen and liver not enlarged. Urine highly coloured, scanty. Pulse dicrotic; no weakness of first cardiac sound. Lungs normal. No subsultus tendinum.

During the ensuing fortnight I tested the urine twice daily for albumen (nitric acid in the cold), but never found any, and auscultated the heart, but never found weakness or muffling of the first sound. I likewise tested for enlargement of the liver and spleen, but could never detect either. The patient's relatives were instructed henceforth to examine all motions for blood or tar-like substance, &c., but they invariably reported that none was ever found.

April 7.—Morning. During the night another motion similar to the previous one, and after it much abdominal pain. Patient had slept very badly. A good deal of eructation, as also during the previous day. Right side of abdomen softer. No rash.

Evening. Temperature lower and general condition better than during the previous evening.

April 8.—Morning. Patient had slept better. Another attack

of epistaxis at 8 a.m. Abdomen not so swollen and less tender. Tongue tremulous. Marked typhoid odour.

Evening. Patient distinctly better. Temperature once more lower. Patient had been lying on his side during part of the day. Motion this afternoon (first time since evening of April 6) similar to the last one, but no pain after it. Patient had consumed nothing but milk since April 5. No rash.

April 9.—Morning. Peasoup-like motion during the night. Patient had slept very well. Temperature normal. Patient looking more lively; spoke without being spoken to first, and laughed for the first time since the commencement of his illness. Less pain in abdomen, very little contraction of abdominal muscles.

Evening. Two peasoup-like motions since the morning. Urine clear and of normal colour. Two rose-coloured spots on the abdomen. Patient had consumed some eggs and milk.

April 10.—Morning. Temperature (both morning and evening) about normal from now onwards. Patient sat up in bed most of the day (first time since April 6). One peasoup-like motion during the morning. Breakfast, milk and eggs; dinner, fish; supper, milk, bread and butter.

Evening. Two more motions during the day, same colour, but not so loose as the morning one. Less tenderness in abdomen.

April 11.—Morning. One motion at 5 a.m., darker in colour, but diarrhœic; another at 7 a.m., same colour as last, but of ordinary consistency.

Evening. Patient got up and sat in an arm-chair for an hour this afternoon. Rash disappeared. Another diarrhœic motion during the evening. Diet same as during the previous day.

April 12.—Morning. Yellowish somewhat diarrhœic motion during the morning. Breakfast, milk, one egg, a little fish, bread and butter.

Evening. Patient had sat in an arm-chair most of the day, and had been walking up and down in his room at intervals. No pain in the abdomen, but still some tenderness to deep pressure, and a sense of fulness on palpation. I administered a fairly gentle stomach exercise to-day for the first time. Dinner, soup and milk; supper, fish and milk.

April 13.—Only one motion to-day, light brown and diarrhœic.

Eructations, which had been persisting since April 6, almost disappeared. Breakfast, same as the last, with the addition of a little coffee; dinner, a small piece of mutton; supper, same as the last.

April 14.—Apathy entirely disappeared; appearance of face normal. Two motions during the day, both of normal consistency, although light in colour. Mutton both for breakfast and dinner.

April 15.—Typhoid odour gone. Two motions, one normal as regards colour and consistency, the other lighter in colour and looser. Breakfast, two eggs, pancakes, milk, coffee; dinner, soup, fish; supper, fish, one egg, bread and butter.

April 16.—Two motions just like those of the previous day. Breakfast, two eggs, milk, coffee; dinner, fish, pork chop and potatoes; supper, fish, bread and butter, milk. Patient went out for half an hour's walk.

April 17.—Two apparently normal motions. From to-day onwards the motions presented no abnormality as far as could be detected by inspection and odour. Patient took an hour's walk during the morning and half an hour's walk in the afternoon.

April 18.—Patient was out walking altogether for three hours. Two motions.

April 19.—Patient walked to my house for treatment (distance one mile). Treatment once a day henceforth. Beyond a slight sense of resistance in the right half of the abdomen and general weakness patient was normal. Several active movements were performed from to-day onwards, including sitting trunk extension and flexion, PA, which, however, the patient could not execute unaided. One motion. Patient was out walking altogether for five hours.

April 20.—Loin lean stride standing alternate rotation, AR, ringing, PP, given from to-day onwards. One motion.

April 21.—Patient daily getting stronger. One motion.

April 22.—Two motions.

April 23.—No motion.

April 24.—Two motions.

April 25.—One motion.

April 26.—One motion. Patient able to-day to do sitting trunk extension and flexion, PA, without help.

April 27.—Not treated. Two motions.

April 28.—One motion. Patient weighed himself to-day and

found that he weighed 64 kilos. as compared with 68 kilos. in the beginning of March.

April 29, 30.—One motion.

May 1.—Not treated. One motion.

May 2.—One motion.

May 3.—One motion. Patient said that he felt quite as strong as before his illness. Was treated for the last time.

May 5.—Patient returned to his usual work at the factory.

Treatment.

Head exercise, spinal nerve frictions, vibrations over the right side of the abdomen given in a somewhat upward direction, stomach exercise confined to the left side of the abdomen, side shaking, and patient had to attempt abdominal respiration; spleen and kidney frictions and frictions over the lateral abdominal nerves. As improvement set in the vibrations were executed more energetically, and with greater firmness and pressure; and later on, when the reflex contraction of the abdominal muscles permitted it, the stomach exercise was performed on the right half of the abdomen as well. During convalescence some active exercises for the abdomen were added (see above).

No restrictions were placed on the diet or on the length of time that the patient had to remain in bed; he was allowed absolute freedom in both respects.

Whooping Cough.

A. W., female, aged 4, came under the manual treatment on October 16, 1901.

Previous history.—Patient had been quite strong and healthy until seven months previously when she had an attack of diphtheria, from the effects of which she had never completely recovered.

History of present illness.—Patient had often played during the summer with several children about her own age, three of whom developed whooping cough about the middle of September. A week later she began to cough a little, but her mother took little notice of this, thinking that she suffered merely from an ordinary cold. After a week, however, the paroxysmal stage of whooping cough set in. Patient had typical attacks of whooping, which sometimes came spontaneously and were sometimes

induced by crying or emotion ; they frightened her considerably, and during their progress she became blue in the face, with starting of the eyes. On occasions vomiting immediately followed the cessation of the whoop. The average of attacks had been fairly constant during the past fortnight ; some three or four took place during each day and from ten to twenty during each night. Catarrhal condition of the bronchi was evident on auscultation. There was no fever. Treatment administered once a day henceforth.

October 17.—Patient had twelve attacks during the night, and none at all during the day.

October 18.—Patient coughed a good deal during the night, but there was no whooping.

October 21.—One whoop during the day, after which no more occurred. Patient slept all night.

November 21.—Bronchi normal. No cough.

December 6.—Treatment continued daily to this date, then stopped. Patient had not coughed at all since about November 21.

Treatment.

Chest vibration, side shaking, shaking over the bladder and in the subcostal angle, inducing patient to attempt several consecutive deep respirations, spinal nerve frictions, specially interscapular, vibrations on the medulla, stomach exercise. Later on (about November 12) chest clapping was added.

Measles following on Whooping Cough.

E. P., female, aged 17 months, came under the manual treatment on August 30, 1902.

Previous history.—Quite good.

History of present illness.—Patient had been suffering for the previous three weeks from whooping cough in the paroxysmal stage, the malady having been most severe during the third week. She experienced eight to twelve attacks of whooping during the day, and several during the night. About August 26 her parents noticed that she had a continual loose cough, and thought that she must have caught cold. August 27, patient worse. August 28, patient still worse and afflicted with watering of the eyes and running from the nose ; parents thought she was feverish.

August 29, patient still worse, parents could hear loud bubbling sounds in the chest; during the evening they noticed redness of the skin. August 30, chest symptoms worse, and measly rash fully developed. I was called in during the evening of the same day.

Examination.—Patient in bed, very restless, crying continually and perspiring freely; had eaten nothing during the day. Much lachrymation and nasal coryza. Typical measles rash over the whole body. Alæ nasi working with respiration, which was laboured; some cyanosis. Loud coarse râles heard at some distance from patient and on auscultation over both lungs; no percussion dullness. Patient had been suffering from diarrhœa to the extent of four or five motions daily, but her mother informed me that the child was just cutting two teeth and that she always suffered from diarrhœa on such occasions. Temperature 102·2°, respiration 88, pulse 186 before treatment; 101·3°, 64 and 160 respectively after treatment. Patient went to sleep. Treatment twice a day henceforth.

August 31.—Morning. Patient had had a fairly good night, and during the morning had been sitting up and looking about, which she did not do at all during the previous day. Not so restless or irritable, less lachrymation, rash fading. Temperature 101·6°, respiration 58, pulse 176 before treatment; 101·3°, 67, 165 respectively after treatment. After I left patient consumed some milk.

Evening. Patient better; had been sitting up during most of the day and had consumed a fair amount of milk. Only three diarrhœic motions. Rash still more faded; less lachrymation and coryza, and not so many râles in the chest. Temperature 102°, respiration 84, pulse 166 before treatment; 101·8°, 80 and 160 respectively after treatment.

September 1.—Morning. Condition of patient slightly improved. Temperature 100·6°, respiration 88, pulse 160. Desquamation commenced.

Evening. Patient very irritable, and cried during the whole of the treatment, so I did not count her pulse or respiration. Temperature 100·8°.

September 2.—Morning. Patient had perspired very much during the first half of the night, and then went to sleep. On awaking, much better; sat up during the greater part of the

morning. Appetite poor however; diarrhœa still the same as on August 31. Rash faint. Lungs clearing up. Temperature 98·6°, respiration 62, pulse 150.

During the course of the day patient coughed very much, but was free from whooping.

Evening. Temperature 100°, respiration 72, pulse 150.

September 3.—Morning. Patient much better; appetite normal again; diarrhœa less. Rash hardly visible on face. A few fine crepitations in the lungs were the only abnormal sounds to be heard. Temperature 99·7°, respiration 48, pulse 132.

Evening. Some return of the attacks of whooping during the day; otherwise better. Temperature 99·1°, respiration 50, pulse 136.

September 4.—Treatment once a day henceforth, each morning. Patient stronger; less cough. Lungs almost normal. Temperature 98·8°.

September 5.—No more whooping. Lungs normal. Temperature 37°. Still some diarrhœa.

September 6.—Temperature 98·4°. Patient had not passed urine for eighteen hours; micturition, however, took place immediately when I administered shaking over the bladder. Diarrhœa ceased.

September 7.—Some return of attacks of coughing, resembling whooping cough to some extent.

September 9.—Cough less.

September 11.—Slight cough left, no resemblance at all to whooping cough. Lungs normal. Rest of patient normal. Treatment for the last time.

(The temperatures were all taken *per rectum*.)

Treatment.

During the acute stage:—Head exercise, including vibrations on the medulla, fronto-nasal running vibration; chest vibration, side shaking; spinal nerve frictions, specially interscapular; stomach exercise, liver, spleen and kidney frictions, shaking over the bladder. During the convalescent stage:—Chest vibration, side shaking; spinal nerve frictions, especially interscapular, forwards lying back exercise, stomach exercise, spleen and kidney frictions, shaking over the bladder; double arm rolling; leg rolling.

Measles.

H. L., male, aged $3\frac{1}{2}$, came under the manual treatment on August 6, 1902.

Previous history.—At the age of about nine months it was noticed that he had a cyst in his neck near the clavicular insertion of the left sterno-mastoid, and this caused a chronic irritative croupy-like cough every winter since his birth. During the month previous to his attack of measles patient had had large numbers of furuncles appearing in crops at intervals; these discharged pus and itched so that he was driven to scratch them. When I first saw patient he had eighteen of these furuncles situated on his trunk and arms, each of which (together with its margin) was about the size of a threepenny bit.

History of present illness.—On August 3 the parents noticed that he had a slight cough, which on August 4 was worse, and was accompanied by an appearance of obvious ill-health. During the afternoon of that day patient was feverish, and the cough still worse; in addition there was running at the nose and redness of the eyes, but no vomiting. August 5.—Aggravation of all the symptoms; during the evening the parents noticed a commencing rash. During the ensuing night patient slept very little. On the morning of August 6 a measly rash had developed, and I was sent for. Owing to pressure of work I was unable to attend the patient until 8 p.m.

Examination.—Patient very irritable, restless, and crying continuously; suffering from great redness of the eyes and continued running from the nose. Typical measly rash over the whole body, most marked on the face. Signs of acute diffuse bronchitis with diffuse râles, the latter audible at a distance of some feet. Temperature 102·6°, pulse 154. After treatment patient was much less irritable and restless (this happened after every treatment in the fever stage), and was able to look at a picture-book. Temperature 101·1°, pulse 144. Half-an-hour afterwards a normal motion took place.

August 7.—Morning. Patient had slept very little. General condition better, eyes less red, and less discharge from nose. Temperature 99·5°, pulse 160. After treatment he dressed and was up for an hour, after which he lay down again for the rest of the day, occasionally, however, getting up and walking about for a few minutes.

Evening. Patient had eaten nothing during the day except two small biscuits, and was very irritable and restless. Rash quite out, except on hands. Temperature 102·6°, pulse 165; after treatment 102° and 160 respectively.

August 8.—Morning. Patient had slept very little, and had taken a little milk for breakfast. Eyes less red; slight desquamation on cheeks. Temperature 98·3°, pulse 120. After treatment patient was up for two hours, and spent the rest of the day alternately in lying down and getting up and walking about.

Evening. No motion during the day. Patient had eaten nothing since breakfast; was very irritable and crying continuously. Eyes no longer red; very little discharge from nose. Rash more marked on hands, but fading on face and legs. Temperature 103·1°, pulse 156; after treatment 102·2° and 150 respectively.

August 9.—Crisis during the night; at about 4 a.m. profuse sweating, after which patient fell sound asleep; on awaking (at 8 a.m.) better in every respect. Took milk, bread and butter for breakfast; normal motion followed.

11 a.m. Patient up and walking about; much more cheerful, and hardly irritable at all. Rash fading away rapidly; desquamation on rest of face and trunk; cough much less; lungs clearing up. Temperature 96·8°, pulse 120. Treatment only once a day henceforth.

At 2 p.m. patient ate an egg, and then slept until 8 p.m.

August 10.—Patient had slept well the whole night. Appetite still poor. Desquamation proceeding on arms and legs.

August 11.—Lungs quite cleared up. No expectoration from bronchi.

August 12.—No more desquamation visible. Patient went out for a walk of ten minutes.

August 13.—Patient very well; appetite normal. Furuncles, which had been healing rapidly since the crisis, now represented by pink spots.

August 17.—No treatment.

August 18.—Patient walked to my villa and back for treatment (distance three-quarters of a mile each way).

August 22.—Normal motion every day since the 10th. Patient quite well and strong. Scars of the furuncles light pink in colour. Treatment for the last time.

(The temperatures were all taken *per rectum.*)

Treatment.

During the acute stage: Head exercise, vibration of the cyst in an outward direction to relieve the pressure on the larynx, spinal nerve frictions; fronto-nasal running vibration; chest vibration, stomach exercise, liver, spleen and kidney frictions. During the convalescent stage: — Chest vibration, stomach exercise, kidney frictions, forwards lying back exercise, and a few general strengthening movements.

Scarlet Fever.

During the spring of 1902 there occurred a small epidemic of scarlet fever, together with some cases of mumps, in a group of workmen's houses close to where I was practising at Sanna.

My endeavours to isolate the patients and thus stop the progress of the epidemic were not always successful; this was due to a lack of co-operation on the part of the patients themselves, who did not and apparently could not understand the risk they were running both for themselves and for others. The manager of the estate reported that he frequently saw my patients, while yet desquamating and hardly free from fever, walking about out of doors. Also, in order to save themselves and their relatives trouble, some of the patients would, as soon as allowed out of bed, when they wished to effect a rectal evacuation, walk out of doors to the closets, which as is usual in Sweden were situated in a separate building removed from the dwelling houses by a distance of about some fifty yards.

The following was the routine treatment adapted for uncomplicated cases:—During the acute stage; head exercise, vibrations or shakings on the tonsils, submaxillary region, and on any inflamed lymphatic glands in the neighbourhood, frictions on the nerves of these parts; spinal nerve frictions, heart vibration or shaking, side shaking, stomach exercise, kidney frictions, spleen frictions. During the convalescent stage; forwards lying back exercise, PP, kidney frictions, stomach exercise, and a few purely active or duplicate movements for the circulation, and to strengthen the entire body.

The treatment for mumps will be found described on p. 290.

The same method of testing for albumen was used throughout;

nitric acid was added in the cold, and the test tube allowed to stand for fifteen to twenty minutes before drawing a definite negative conclusion.

The following account comprises all the cases of the scarlet fever epidemic, together with some of the cases of mumps.

Case 1.—Scarlatina Anginosa.

A. C., female, aged 15.

Previous history.—Had always enjoyed excellent health.

History of present illness.—Patient had been feeling quite well until the evening of February 20, 1902, when she began to feel

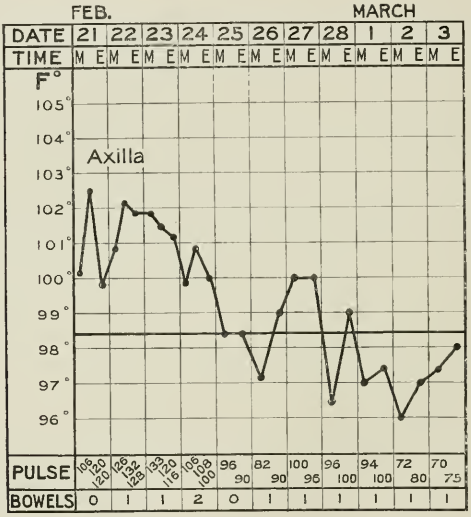

Fig. 91.

ill and slept badly. At 5 a.m. on February 21 she was attacked with bad pain in the head, throat, back, and abdomen, and also with vomiting. The vomit was of a greenish colour, and persisted at intervals for about seven hours, when it suddenly ceased.

Examination.—February 21, 1.30 p.m. Patient had eaten nothing during the day. She complained of bad headache, of

pain in the throat and back, and to a lesser extent of pain in the abdomen. The tongue was white, and both tonsils were swollen. The abdominal muscles were contracted, and there was general tenderness of the abdomen, especially in the epigastrium. A sample of the vomit that was shown to me contained large quantities of bile. The urine was highly coloured, scanty in amount, and contained no albumen. For temperature and pulse see separate chart (fig. 91). Treatment three times a day henceforth.

5 p.m. Patient had vomited once since last treatment. Headache worse; pains in both legs had set in. More swelling of tonsils, which were redder; white patch of membrane on left tonsil, none on right; cervical glands not swollen. A bacteriological examination of a portion of the membrane cultivated in gelatine for twenty-four hours at a temperature of 75° F. revealed a number of whitish spots, which under the microscope were identified as cocci, some being arranged in pairs and encapsuled, others being in irregular groups.

8 p.m. No more vomiting had taken place. Scarlatinal rash commencing on face, chest, and abdomen. Skin harsh and dry. Headache worse; pains in back and limbs less severe. Membrane on left tonsil larger. No albumen, but nitrate of urea formed on adding nitric acid.

February 22.—Morning. Patient had slept very little. Very little pain in back and legs. Headache better. Face very red, except just around mouth. Rash on trunk fully developed. Membrane on both tonsils. Strawberry tongue. No albumen.

Afternoon. No pains in back. More pain while swallowing, but membrane about the same. Enlarged cervical glands. Rash on arms, but not on legs. No albumen.

Evening. Headache almost gone. Large erythematous-like patches on forearms; rash on legs, but not yet on feet. Tonsils about the same. No albumen from urine, but nitrate of urea formed on adding nitric acid.

February 23.—Morning. Rash on feet visible; face less red; desquamation commencing on it. Tonsils about the same. No headache.

Afternoon. Patient had eaten again after two days' fasting. Throat much better; much less difficulty in swallowing, and membranes smaller in size. Urine clearer; no albumen, but

nitrate of urea formed on adding nitric acid to all samples collected during the day. Desquamation over entire face.

Evening. Throat better. Patient had consumed a good deal of milk.

February 24.—Morning. Patient had slept fairly well. No desquamation on body as yet. Urine: no albumen, but nitrate of urea formed on adding nitric acid.

Evening. Patient had been sitting up during most of the day. Only a slight difficulty in swallowing. Urine: no albumen; from to-day onwards no nitrate of urea formed on adding nitric acid.

February 25.—Morning. No difficulty in swallowing. Membrane on tonsils gone, and the latter only slightly red. Desquamation on neck, not on body. Temperature normal. Treatment twice a day henceforth.

Evening. Patient said she felt very well, although weak. Up during most of the day. No albumen.

February 26.—In consequence of her mother being to-day attacked with scarlet fever, patient was up all day and attended to cooking and housekeeping, in the absence of anybody else to do the work.

Morning. Face hardly red at all. Desquamation on hands and chest. Patient stronger than yesterday. No albumen. Treatment once a day henceforth.

Febrnary 27.—Desquamation over whole body, but not yet on hands. Patient stronger, and went out during the day against my orders. No albumen.

February 28.—Patient stronger. No albumen.

March 1.—Desquamation on hands, but not yet on feet, which in fact never peeled at all. No albumen.

March 2.—Patient felt almost restored. No albumen.

March 3.—Patient felt quite well; had been out during the greater part of the day since February 28 against my orders. Desquamation only on left hand; rest of body normal. No albumen. Treatment interrupted for three days.

March 6.—Desquamation finished. Patient quite strong. No albumen. Treatment for the last time.

The heart remained unaffected throughout.

October 8, 1902.—Patient had continued in perfect health ever since her illness, and stated that she felt better than previous to it.

CASE 2.—SCARLATINA ANGINOSA.

Mrs. H. C., aged 39, mother of A. C. (Case 1, p. 266).

Previous history.—Quite good.

History of present illness.—During the evening of February 25, 1902, patient, after feeling tired all day, was attacked by a bad headache. During the night she slept badly, and during the next morning had fever, sore throat and pains in the whole of the body, the headache being much worse; she suffered from rigors all the morning, but not from vomiting.

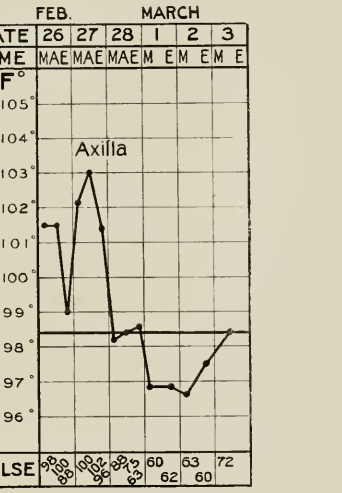

FIG. 92.

Examination.—February 26, 12 noon. There was redness of the throat, and a large patch of membrane on the left tonsil; the cervical glands were enlarged. A bacteriological examination of the membrane revealed the same features as in the case of her daughter (p. 267). For temperature and pulse, see separate chart (fig. 92). Treatment three times a day henceforth.

6 p.m. Headache worse; pains in legs worse. No vomiting. Rash on face except around mouth. No urine passed as yet

9 p.m. Headache and pains in legs better. Rash on face, but nowhere on trunk or limbs. Urine passed at 6 p.m.; no albumen.

February 27.—Morning. Patient somewhat better. Membrane on both tonsils. No albumen.

Afternoon. Great pain in lumbar region. No albumen.

Evening. Face not so red; throat better. Patient had eaten an orange. Strawberry tongue. No albumen.

February 28.—Morning. Patient much better. Face no longer red. Membrane on left tonsil gone. Temperature normal. No albumen.

Afternoon. Patient complained only of weakness and of a difficulty in swallowing. Slight desquamation on face. No albumen.

Evening. Membrane on right tonsil smaller. No albumen.

March 1.—Morning. No pains in back, but some in both sides over lower ribs; however, I could find nothing objective in this area. Pain removed by treatment. Patient felt weak; otherwise complained only of a slight difficulty in swallowing. Treatment twice a day henceforth.

Evening. Patient had been sitting up all day. Slight membrane on right tonsil. Desquamation on face finished. No albumen.

March 2.—Patient very well and up all day. Eating her usual fare. No membrane on tonsil. Throat normal. No albumen.

March 3.—Patient went out during the course of the day (temperature below freezing point). No albumen. Treatment once a day henceforth.

March 6.—Patient quite strong. No albumen. Treatment finished. Patient went back to work on the estate as usual.

The heart remained unaffected throughout.

October 8, 1902.—Patient had continued in excellent health ever since her illness.

Case 3.—Scarlatina Anginosa.

E. L., female, aged $15\frac{3}{4}$.

Previous history.—Quite good.

History of present illness.—Patient felt quite well until the evening of February 27, 1902. She slept badly, and on getting

up on February 28 experienced headache, pain in back and legs, and difficulty in swallowing, but did not vomit. She walked over to my villa at 9 a.m.

Examination.—Patient looked feverish, and I could see a membrane on the left tonsil. I told her to go home at once, which she did. On arrival home she was seized with a rigor lasting ten minutes.

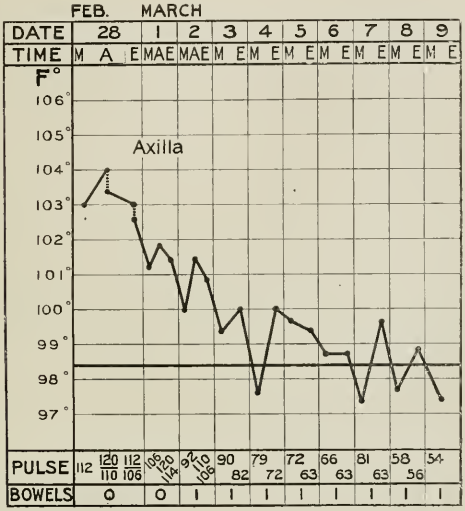

Fig. 93.

For temperature and pulse see separate chart (fig. 93). I requested patient's mother to keep all the urine passed, and during each visit I estimated the amount, took the specific gravity and tested for albumen. (See p. 273 for results of this examination.) Treatment three times a day henceforth.

3 p.m. Headache very bad, but better after treatment. Patient perspiring freely.

9 p.m. Patient had been asleep during the afternoon, and drank some milk on waking up. Headache better. Membrane on both tonsils; considerable difficulty in swallowing.

March 1.—9 a.m. Patient had slept fairly well. Scarlatinal rash on body and face, except just around mouth. Less difficulty in swallowing; membrane on left tonsil smaller. White tongue. Pain in right ear; removed by treatment, not to return.

3 p.m. Patient had been sitting up. Rash on arms; that on body less red. Strawberry tongue.

9 p.m. Patient feeling very well in spite of the amount of fever present. Enlarged lymphatic glands on right side below angle of jaw.

March 2.—Morning. Patient had slept very well. Motion to-day for first time since commencement of illness. Rash well marked on arms, hands and feet; desquamation commenced on face. Membrane on left tonsil almost gone, and that on right tonsil much smaller.

Evening. Condition about the same. Treatment twice a day henceforth.

March 3.—Desquamation on hands. No membrane on tonsils. Patient better, and up during part of the day.

March 4.—Rash almost disappeared. Desquamation on face nearly finished; hands and feet never peeled at all. Difficulty in swallowing almost gone. Patient up all day. Headache bad during the afternoon.

March 5.—During the morning bad headache and pains in stomach and side; nothing objective, however, in the areas where they were felt. Desquamation almost finished. Patient resumed usual diet, and was up all day.

March 6.—No headache; throat normal; pain in back and sides, but not so bad as during the previous day. Nothing objective in sides.

March 7.—Pain in one side; patient otherwise normal, except for slight weakness and the last remains of desquamation.

March 8.—Desquamation finished.

March 9.—Patient went out (temperature — 7° C.), and was in normal health. Treatment finished.

March 10.—Patient out all day.

The heart remained unaffected throughout.

The treatment was on the lines already indicated, with the addition of vibrations, shakings, and nerve frictions over the painful areas in the back and sides, and on one occasion (March 1) ear exercise, PP.

Urine.

Date			Quantity in Cub. Cent.	Total		Specific Gravity		Albumen
Feb.	28	.. Evening ...	136	136	...	1033	...	none
March	1	... Morning ...	150	530	...	1034	...	,,
		Afternoon ...	180			1030	...	,,
		Evening ...	200			1030	...	,,
,,	2	... Morning ...	260	540+	..	1031	...	,,
		Afternoon ...	130			1029	...	,,
		Evening ...	150+			1029	...	,,
,,	3	... Morning ...	310	630+	...	1025	...	,,
		Evening ...	320+			1022	...	,,
,,	4	... Morning ...	220+	740+	...	1026	...	,,
		Evening ...	520			1018	...	,,
,,	5	... Morning ...	520	690+	...	1020	...	,,
		Evening ...	170+			1019	...	,,
,,	6	... Morning ...	560	990+	...	1017	...	,,
		Evening ...	430+			1015	..	,,
,,	7	... Morning ...	750	950+	...	1016	...	,,
		Evening ...	200+			1016	...	,,
,,	8	... Morning ...	390	915+	...	1017	...	,,
		Evening ...	525+			1018	...	,,
,,	9	... Morning ...	360	...	..	1017	...	,,

About six weeks later patient took a situation as a general servant; the last news I had of her (September, 1902) reported her to be in very good health indeed.

Case 4.—Scarlatina Simplex.

G. C., female, aged 9, who was under treatment for apoplexia cerebri, and was living in one of the houses in the group previously specified, was the next to be affected. The attack, which was a very mild one, began on March 1. Patient complained of headache, pain in the back, and difficulty in swallowing. Beyond very slight fever (maximum 99·6° in the axilla), redness of the tonsils, and slight redness of the chest, the latter disappearing the following day, there were no objective symptoms. The urine remained practically normal, the highest specific gravity reached being 1025, and I never found any albumen. No desquamation took place. The treatment was administered twice a day during seven days, after which patient came to me again every day to resume the previous treatment for her nervous condition. (The latter will be found reported on pp. 407-414.)

The heart remained unaffected throughout.

Case 5.—Scarlatina Anginosa.

Mrs. E. K., aged 28.

Previous history.—Patient had always been anæmic since about the age of twelve, especially from about her fourteenth to her twenty-second year.

History of present illness.—Patient was attacked with scarlet fever simultaneously with one of her daughters on March 5, 1902.

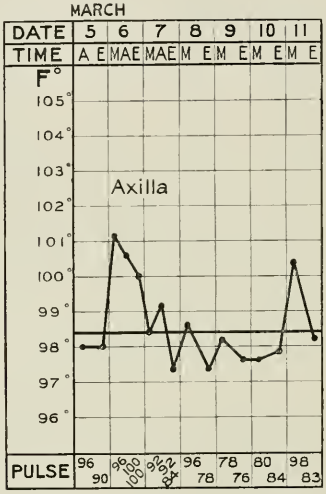

Fig. 94.

All the morning of that day she had rigors, great frontal headache, and pains in throat and back. She felt inclined to vomit, but did not actually do so.

Examination.—Fever (for fever and pulse see separate chart, fig. 94); redness of tonsils and fauces. No albumen in the urine. Treatment three times a day henceforth.

Evening. Membrane on right tonsil. No albumen.

March 6.—Morning. Patient had slept badly. Pain in throat

worse, but headache better. Scarlatinal rash on face, excepting around mouth, but none on body. Strawberry tongue. Membrane on both tonsils.

Evening. Face had typical scarlatinal look; general condition about the same. No albumen.

March 7.—Morning. General condition improved. Throat better; face not so red.

Evening. Patient much better; had been up during the afternoon washing dishes. Membranes on tonsils disappeared; only some redness left. No albumen.

March 8.—Treatment twice a day henceforth. Morning. Patient complained of headache (menstruation commenced today), but was up all day attending to household duties. Desquamation on face commenced. No albumen.

March 9.—Excepting for slight difficulty in swallowing and weakness patient felt normal. No albumen.

March 10.—Patient was up all day, and baked bread; while so doing she exposed herself, together with her two children (see cases 6 and 7), to a strong draught for about three hours during the course of the afternoon, the temperature being considerably below freezing point. Stiffness and pain in the muscles of the back and neck, resulted with tenderness to pressure in the cervical region as well as below the angle of the jaw, also swelling of both parotids. Treated specially for this with muscle kneading, muscle frictions, and frictions on the nerves supplying the muscles, duplicate movements involving them; vibrations and frictions on the parotid glands. No albumen.

March 11.—Pain in neck about the same, but less stiffness in the muscles.

March 12.—Muscles normal; no swelling of parotid. Desquamation on face finished. Treatment finished.

The heart remained unaffected throughout.

On April 13, 1902, patient returned to treatment, in consequence of menstrual disorders, from which she had been suffering, unknown to me, for the past fifteen months. The flow came on irregularly at intervals of two to four weeks, and lasted from three to nine days on each occasion. Patient was given the manual treatment until May 10, when menstruation was once more normal. She was still in very good health when I left Sweden in October of the same year.

CASE 6.—SCARLATINA GRAVIOR WITH MIDDLE EAR DISEASE.

M. K., aged 6 months, daughter of Mrs. E. K. (see Case 5), was attacked simultaneously with her mother, *i.e.*, on March 5, 1902.

Previous history.—Patient was born at full time, and had always been healthy.

History of present illness.—The rash came out on March 6, the temperature reaching 102° (*per rectum*); there were no throat symptoms beyond slight redness of tonsils. On March 9, desquamation had commenced; the temperature was normal. On March 10 patient was exposed to a draught for three hours as mentioned on p. 275, in consequence of which acute suppurative middle ear disease set in on the left side. On March 13 the abscess perforated the tympanum, and the discharge continued to be yellowish in appearance until about March 30, whereupon it became watery, and, gradually diminishing, ceased on April 10. The treatment for the ear condition was ear and mastoid vibration and syringing.

I was only able to test the urine on March 6, 12, 13, and 14. It contained no albumen on any of these occasions.

October, 1902.—Child apparently in perfect health. Hearing normal. No ear symptoms.

CASE 7.—SCARLATINA ANGINOSA, FOLLOWED BY A CHILL WITH SPINAL SYMPTOMS, AND EPIDEMIC PAROTITIS. (?)

R. K., aged 2½, daughter of Mrs. E. K. (Case 5, p. 274.)

Previous history.—Quite good.

History of present illness.—During the course of March 6, 1902, mother noticed that the child was irritable, always wanting to lie down, and that during the afternoon her face was very red. I was sent for in the course of the evening.

Examination.—I found patient with a scarlatinal rash on trunk and face, except just around the mouth; some membrane was present on both tonsils. There was fever (for fever and pulse see separate chart, fig. 95). The urine contained no albumen.

March 7.—Rash on arms and legs. Membrane on tonsils about the same. Patient consumed some bread and milk during the course of the day, and got up and walked about during the afternoon. No albumen, but one sample of urine gave a pre-

cipitate of nitrate of urea on adding nitric acid. Treatment three times during the day.

March 8.—Treatment twice a day henceforth. Rash less red. Membranes on tonsils less; strawberry tongue. No albumen or nitrate of urea. Patient up during most of the day.

March 9.—Desquamation commenced. Appetite returned. Ordinary diet. Patient up all day. No albumen.

March 10.—Condition about the same as during the previous day. Patient exposed to a draught for three hours, as mentioned on p. 275. No albumen.

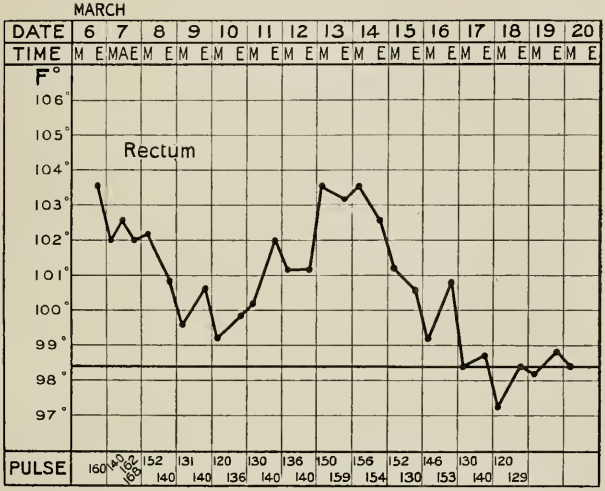

Fig. 95.

March 11.—Desquamation finished, tonsils normal. Rise of temperature. Patient ate nothing during the whole day. No albumen.

March 12.—Patient better. Fever less. During the afternoon, in the absence of her mother, patient ran out in the open air without either shoes or stockings on, the temperature being considerably below freezing point.

During the evening she was worse, and suffered from great irritability, retraction of head and photophobia. No albumen.

March 13.—Temperature still higher. Retraction of head more marked, slight stiffness of muscles of both lower limbs. Exaggerated patellar reflexes and slight ankle clonus on both sides. Extreme tenderness over dorsal spinal nerves, and some tenderness over most areas of the body. Incontinence of urine. I could not test for albumen.

March 14.—Condition about the same. I could not test for albumen.

March 15.—Patient better; temperature lower. No retraction of head; no stiffness of muscles. Reflexes normal. No tenderness over dorsal spinal nerves or rest of body. No incontinence of urine. No albumen.

During the evening bilateral swelling of parotids and submaxillary glands (epidemic parotitis?)

March 16.—Swelling of salivary glands worse.

March 17.—Swelling about the same.

March 20.—Swelling better.

March 24.—Swelling almost disappeared. No albumen during the last nine days.

April 3.—Patient normal; swelling quite disappeared. No albumen during the last ten days. Treatment finished.

The heart remained unaffected throughout.

October, 1902.—Patient had continued in excellent health ever since her illness.

Treatment.

The ordinary treatment for scarlet fever; from March 12 until 16, vibrations over dorsal nerves and spinal cord for about ten minutes, and shaking over the bladder were added. March 15 to 24, ordinary treatment for mumps. March 25 to April 3, ordinary treatment for convalescence from fever.

Case 8.—Mild Case of Scarlatina Anginosa.

T. J., male, aged 16; occupation, stoker in a factory.

Previous history.—Quite good.

History of present illness.—On waking up at about the usual hour on March 7, 1902, patient felt ill, had a headache and pain in the back, and his mother noticed that his face was red. I saw patient at 11 a.m. of the same day.

Examination.—Scarlatinal rash on face, except around mouth, and on body. Membrane on both tonsils. Fever (for fever and pulse see separate chart, fig. 96). No albumen. Treatment twice a day henceforth.

Evening. Headache worse; pain in throat had set in. No pain in back. Lymphatic glands of neck swollen. Rash as before. No albumen. After treatment no headache.

March 8.—Morning. Face less red. No headache, no pain in throat. Patient better, and got up during the course of the day.

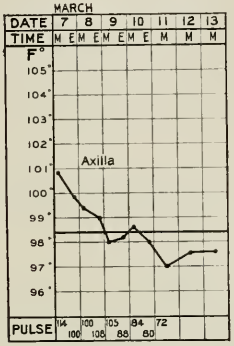

Fig. 96.

Evening. Membrane only on right tonsil. Patient felt nearly well. No albumen.

March 9.—Membrane on right tonsil almost gone. Patient up all day. Temperature normal. No albumen.

March 10.—Morning. Patient eating as usual (meat included). Desquamation on hands and face. Patient went out during the afternoon (against orders).

Evening. No membrane on tonsils, but lymphatic glands of neck still somewhat enlarged. No albumen.

March 11.—Patient practically normal. No albumen. Treatment once a day henceforth.

March 12.—Desquamation finished. Patient went out of doors during the afternoon for three hours (temperature a good deal below freezing point). No albumen.

March 13.—Patient normal. Out all day.

March 14.—Treatment for the last time. Patient resumed work as stoker.

The heart remained unaffected throughout.

Patient had a motion every day of his illness.

October 8, 1902.—Patient had continued in excellent health ever since his illness.

Case 9.—Scarlatina Anginosa.

E. W., male, aged 23.

Previous history.—Quite good.

History of present illness.—During the evening of March 16, 1902, he began to feel ill, and was feverish. During March 17 he felt pains in the head, throat, back, and abdomen, and vomited fairly continuously from 9 a.m. until 6 p.m. I first saw patient in the evening.

Examination.—Face very red, except around mouth; scarlatinal rash on body; membrane on both tonsils. Fever (for fever and pulse see separate chart, fig. 97). Urine (see p. 281).

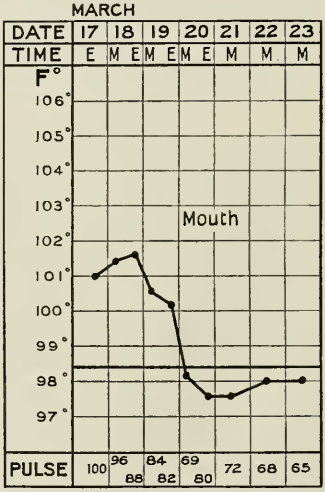

Fig. 97.

March 18.—Treatment twice a day henceforth.

Morning. Rash on hands and feet. Membrane on tonsils about the same. Headache better; pain in back better; no pain in abdomen.

Evening. Membranes on tonsils gone, only redness left. Strawberry tongue.

March 19.—No pain in head or anywhere else. Swallowing normal. Desquamation commenced on face. Patient ate two eggs and meat for dinner; until then had only taken milk. Patient got up during the course of the day.

Evening. Desquamation on hands.

March 20.—Patient feeling very well. Up all day; no fever. Desquamation on body. Ordinary diet, although appetite not yet quite good.

Evening. Slight pain in lower part of back. Tonsils no longer red. Desquamation on feet.

March 21.—Patient up all day. No pain in back. Desquamation on body finished. Treatment once a day henceforth.

March 22.—Desquamation on hands finished; only the ears left peeling.

March 23.—Patient very well indeed.

March 27.—Desquamation only on ears. No albumen during the past four days. Treatment finished.

March 30.—Desquamation only on right ear.

April 1.—Desquamation finished.

Urine.

Owing to his misunderstanding my directions the patient did not invariably keep all the urine passed, but sometimes threw some of it away.

Date		Quantity in cc.	Specific Gravity	Albumen
March 18 ...	Morning	220+ ...	1040 ...	none
	Evening	150+ ...	1035 ...	,,
,, 19 ...	Morning	250+ ...	1033 ...	,,
	Evening	155+ ...	1028 ...	,,
,, 20 ...	Morning	300+ ...	1030 ...	,,
	Evening	120+ ...	1028 ...	,,
,, 21 ...	... ...	250+ ...	1022 ...	,,
,, 22 ...	... ...	450+ ...	1021 ...	,,
,, 23 ...	... ...	300+ ...	1025 ...	,,

The heart remained unaffected throughout.

Patient remained in very good health until about the middle of June, 1902, when he emigrated to America; since then I have heard nothing of him.

Case 10.—Scarlatina Anginosa followed by Epidemic Parotitis.

S. N., female, aged 7.

Previous history.—Patient had never been very strong.

History of present illness.—Patient complained of headache and sore throat during the morning of March 18. She slept very badly, and during the morning of March 19 complained of pain in the throat, head, legs and back. She felt a desire to vomit, but did not actually do so. Three diarrhœic motions took place during the course of the morning. Her mother noticed that the patient's face and body were red. I first saw patient at 3 p.m. on March 19.

Examination.—Scarlatinal rash on face excepting around mouth, also on body, but none on hands or feet. Some fever (for fever and pulse see separate chart, fig. 98). Membrane on both tonsils. Urine, no albumen (see p. 284). Treatment twice a day henceforth.

Evening. Patient ate sausages and brown beans for dinner, and took milk at intervals during the course of the day, also some coffee; had two more diarrhœic motions. Rash on hands. Pain in back very severe, pain in throat about the same; both much relieved by treatment. Some headache.

March 20.—Patient had slept very well during the night. Non-diarrhœic motion during the morning. No headache, only slight pain in back and throat. Desquamation commenced on body and face. Patient got up during the course of the day, and ate her usual fare.

March 21.—Morning. No pain in back or throat; some membrane on the tonsils still present. Patient up all day.

Evening. Membrane on tonsils almost gone. Rise of temperature, and all the signs of mumps on both sides (one brother had the latter disease about three weeks ago and another brother developed it yesterday).

March 22.—Membrane on tonsils gone. Mumps fully developed. Patient complained of a sense of pulsation in right ear. Membrana tympani normal. Patient up all day.

March 23.—Mumps subsiding; no difficulty in swallowing. No pulsation in ear. Desquamation on face finished, and finishing on body. Hands and feet never desquamated. Patient up all day.

March 24.—Swelling still less, only slight in right parotid, none in left. Patient felt very well.

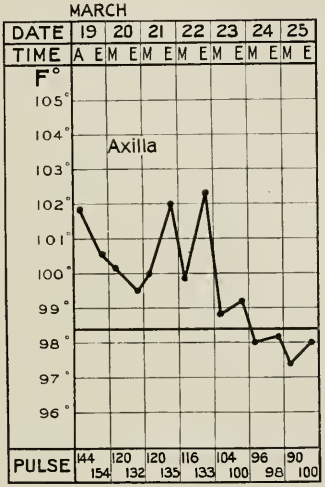

Fig. 98.

March 25.—Patient felt quite well. Treatment only once a day henceforth.

March 26.—Desquamation finished. Patient out all day. No albumen.

March 27.—Only slight swelling in right parotid. No albumen.

March 31.—Patient normal. Treatment finished.

The heart remained unaffected throughout.

Urine.

Date		Quantity in cc.	Total	Specific Gravity	Albumen
March 19 ...	Evening ...	70	70	1020 ...	none
,, 20 ...	Morning ...	200+	360+ ...	1018 ...	,,
	Evening ...	160		1018 ...	,,
,, 21 ...	Morning ...	260	410+ ...	1023 ...	,,
	Evening ...	150+		1018 ...	,,
,, 22 ...	Morning ...	325	675 ...	1016 ...	,,
	Evening ...	350		1017 ...	,,
,, 23 ...	Morning ...	375	475+ ...	1013 ...	,,
	Evening ...	100+		1014 ...	,,
,, 24 ...	Morning ...	260	395+ ...	1010 ...	,,
	Evening ...	135+		1012 ...	,,
,, 25 ...	Morning Evening ...	620	620 ...	1016 ...	,,

Patient remained quite well until April 24, 1902, when she left the district: I have not heard of her since.

Case 11.—Scarlatina Anginosa with Epidemic Parotitis.

A. N., male, aged 6½ months, brother of S. N. (Case 10).

Previous history.—Patient was a full-time child and had never been ill. Was strong and big for his age.

History of present illness.—During the evening of March 28, 1902, patient vomited, and during the night slept very little, vomiting almost every half hour. The mother examined him carefully for any signs of a rash, but found none. (I had told her to report to me at once if any more of her children began to look red in the face or have a rash on the body.) I first saw patient on the morning of March 29; nothing objective except slight fever (100°). During the afternoon, however, he developed symptoms of scarlet fever and mumps simultaneously.

Examination.—Scarlatinal rash on face except around mouth, also on body; membrane on right tonsil; swelling of both parotid and submaxillary glands, the swelling passing downwards into the neck. For temperature see separate chart, fig. 99. Treatment twice a day henceforth.

March 30.—Morning. During the previous day patient ate nothing, but to-day took the breast as usual. Membrane on tonsil gone. Strawberry tongue. Rash on arms and legs.

Evening. Better.

March 31.—Morning. Patient had slept very well. Des-

quamation on back. Swelling of parotid and submaxillary glands better.

April 1.—Redness on body diminishing. Swelling of salivary glands less.

April 2.—Redness almost disappeared. Desquamation on back finished. Rise of temperature, but I could find nothing objective to account for this.

April 3.—Desquamation on abdomen, face and legs. Hands never desquamated at all. Treatment only once a day henceforth (during the evening).

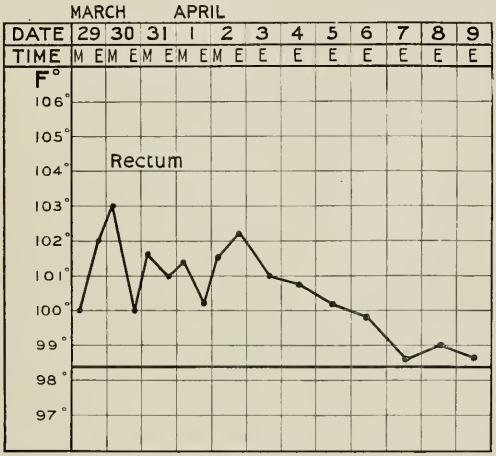

Fig. 99.

April 4.—Desquamation on feet commenced.

April 5.—Swelling of parotids much less.

April 6.—Desquamation only on feet.

April 14.—Desquamation finished. No swelling of parotid or submaxillary glands. Patient normal. Treatment finished.

The heart remained unaffected throughout.

I was only able to test the urine once, on the fourth day of the illness. It contained no albumen.

Case 12.—Scarlatina Simplex followed by Epidemic Parotitis.

I. J., female, aged 14½.

Previous history.—Patient of a very neurotic temperament; had fainted on occasions, and twice during the year had had hysterical attacks. Had always been rather anæmic.

History of present illness.—Patient was attacked during the evening of April 4, 1902, with pains in the head and back; I saw her at 9 p.m. of the same day.

Examination.—Temperature 101° (for temperature and pulse see chart, fig. 100), otherwise nothing objective. Throat unaffected. Urine (see pp. 287, 288).

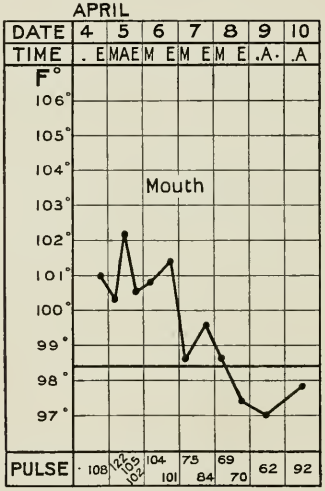

Fig. 100.

April 5.—Morning. Patient had been vomiting; she had suffered from great frontal headache and pain in the back, but had no difficulty in swallowing. Scarlatinal rash on face, except around mouth, also on body; not yet on arms. Redness of both tonsils.

Evening. Patient had eaten nothing during the day. Pains in head and back better. Rash on arms. Treatment three times.

April 6.—Morning. Patient felt better. No pain in the back; but still some headache present. Strawberry tongue. Patient ate pancake for breakfast.

Evening. Headache better, but pains in knees. Rash on body disappearing, entirely gone from both arms. Treatment twice a day henceforth.

April 7.—Rash on body gone; only slight redness of face, on which desquamation had set in. No pains anywhere. Patient got up, and remained up during most of the day; felt weak but otherwise normal.

Evening. Desquamation on hands.

April 8.—Patient resumed ordinary diet, including meat, coffee, &c. During the evening the urine formed nitrate of urea on adding nitric acid.

April 9.—Treatment once a day henceforth. Patient up all day. Desquamation nearly finished.

April 10.—Desquamation only on one finger.

April 11.—Desquamation finished. Patient went out (against my orders) for a two-mile walk (temperature considerably below freezing point).

April 12.—Patient was out for three hours (against my orders).

April 13.—Pains in both knees and muscles of anterior tibio-fibular regions of both sides; removed by treatment (vibrations, muscle kneadings, foot rolling, PP, flexion, AR, extension, PR, anterior tibial nerve frictions, PP).

April 14.—An attack of mumps supervened, the temperature rising to 100·4° F. Treatment twice a day henceforth.

April 15.—Fever gone. Swelling of salivary glands less.

April 19.—Hardly any signs of mumps left. Treatment this morning for the last time.

April 22.—No sign of mumps left.

The heart remained unaffected throughout.

Urine.

Date		Quantity in cc.	Total	Specific Gravity	Albumen
April 5 ...	Morning ...	100+	190+ ...	1042 ...	none
	Evening ...	90+		1042 ...	,,
,, 6 ...	Morning ...	200	450+ ...	1040 ...	,,
	Evening ...	250+		1036 ...	,,

Date			Quantity in cc.	Total	Specific Gravity	Albumen
April	7	... { Morning ... / Evening ...	260 / 160+	420+	... { 1036 / 1036	... none / ... „
„	8	... { Morning ... / Evening ...	250 / 240+	490+	... { 1030 / 1034	... „ / ... „
„	9	... ...	910	910	1031	... „
„	10	... ...	860+	860+	... 1028	... „

Patient, excepting for catching a bad cold about a fortnight later, remained in very good health until June of the same year; in that month she took a situation as servant and I heard no more of her.

Case 13.

Dr. Harry Kellgren has kindly allowed me to publish the following case treated by him, January-February, 1901:—

H. A., aged 7.

Previous history.—Patient when quite young had measles, but otherwise had always been strong and healthy. Since attending school, patient had from time to time felt very tired in his eyes and occasionally had headaches together with a slight amount of fever and vomiting.

History of present illness.—In consequence of patient looking ill, I was sent for during the evening of January 25, 1901.

Examination.—Patient complained of headache, vomiting, some cold in the head, and pain in the throat on swallowing. On inspection the tonsils were red, the tongue rather furred; the eyelids swollen, and could only be opened with difficulty. Photophobia. Skin somewhat raw. No fever; pulse full and strong. Lungs and heart healthy.

January 26.—Morning. The symptoms already mentioned unchanged. Light red eruption on the trunk. Temperature 40·2°, pulse 110. Motion during the morning. Urine very scanty, and concentrated, but not otherwise abnormal. Treatment three times a day.

January 27.—Morning. There had apparently been high fever during the night. Temperature 40·4°, pulse 120.

Noon. Headache and sore throat much better. No vomiting. Strawberry tongue.

Evening. Typical scarlatinal rash, very marked over the whole body, excepting on the forehead and around the mouth.

Frequent micturition; urine contained urates. Temperature 39·5°, pulse 110.

January 28.—Morning. Patient had slept well; disposition much more cheerful; appetite returned. Rash a little paler. Temperature 37·5°, pulse 90.

Evening. Temperature 37·5°, pulse 100. Desquamation considerably advanced. Eyelids better. Tonsils normal; tongue no longer furred. Appetite good; patient cheerful.

January 29.—Morning. Temperature 37·3°, pulse 84. Patient's appetite and frame of mind very good. The kidneys, which had throughout been very sensitive, no longer so tender. Urine normal.

January 30.—Temperature 37·2°, pulse 74. Motion during the day. General condition very good. Desquamation not yet quite completed. Kidneys still rather tender. Urine normal.

The treatment up to date had been: head exercise, throat exercise, spinal nerve frictions, stomach exercise, kidney frictions, shaking and vibration over the bladder; stretch lying running nerve frictions, PP.

January 31.—From to-day onwards the patient underwent a general strengthening treatment.

February 5.—The treatment was administered for the last time. The patient was then quite cured, and felt stronger and better than before his illness.

Epidemic Parotitis.

The following was the worst case that occurred during the epidemic referred to on p. 265 :—

G. J., male, aged 9.

Previous history.—Patient suffered from tuberculous glands in the neck for a year, 1898 to 1899, but recovered, and since then had always been fairly strong.

History of present illness.—Patient went to school as usual on April 10, 1902; during the evening of that day he experienced a slight pain in his neck. He passed a bad night, and was much worse the following morning (April 11); there was more pain, and swelling had arisen on both sides of his neck. I was sent for at 10 a.m.

Examination.—Swelling of both parotid glands, extending down side of neck, and swelling of both submaxillary glands; thickness of speech, difficulty and pain on talking; pain on swallowing. Great tenderness over the swollen glands. Temperature 102°, pulse 100. Treatment twice a day henceforth.

Evening. Condition about the same; temperature 102°, pulse 100. Patient had eaten nothing during the day.

April 12.—Morning. Swelling less. Temperature 99·6°, pulse 84.

Evening. Swelling less; temperature 100·8°, pulse 84. Patient had drunk some milk and eaten some rusks.

April 13.—Morning. Swelling less; hardly any pain at all on swallowing. Temperature 98·6°, pulse 82. Appetite had returned, and usual food was taken. Patient got up, and, against my orders, went out during the afternoon.

Evening. Swelling still less; temperature 98·1°, pulse 90. Swallowing normal.

April 14.—Morning. Temperature 98·4°, pulse 84. Patient out all day.

Evening. Temperature 98°, pulse 76. Swelling still less, and confined to the parotids. Submaxillary glands normal.

April 15.—Morning. Temperature 99°, pulse 78.

Evening. Temperature 98°, pulse 72. Swelling still less.

April 16.—Morning. On my arrival I found that patient had felt so well that he had gone to school as usual.

Evening. Very little swelling of parotids; temperature 98·4°, pulse 74. Treatment as usual.

April 17.—Hardly any swelling of parotids. Treatment once a day henceforth.

April 20.—No swelling. Treatment finished.

The temperatures were all taken in the mouth.

Treatment.

Vibrations and shakings, followed by frictions on the salivary glands and on the swollen lymphatic glands; running vibrations from above downwards along the sterno-mastoids; frictions on the facial nerves and on the nerves lying in the submaxillary region. General treatment for fever.

Diphtheria.

Nasal, tonsillar, pharyngeal, and laryngeal diphtheria occurring in myself; treated December, 1899, to January, 1900.

Edgar F. Cyriax, aged 25.

Previous history.—Patient had been feeling more or less weak and fatigued for several months, and had been attending continually to a child with diphtheria from November 27 to December 3, 1899; this had caused a considerable extra strain (see appendix).

History of present illness.—On December 2 he felt some uneasiness in his tonsils. He slept badly during that night, and on December 3 there appeared redness and swelling of both tonsils; during the evening of the same day a small patch of membrane could be seen on the left tonsil.

December 4.—Membrane had spread to right tonsil, and was of a gray colour. Swallowing was difficult; tonsils were very much swollen. During the course of the day the uvula became enlarged, and the voice slightly husky.

December 5.—During the night a further increase took place in the size of the uvula, which became so long that it continually touched the patient's tongue and fauces, preventing any sleep; a great amount of salivation was set up. The voice became more and more hoarse during the course of the day. During the evening the bacteriological laboratory reported that a culture taken from patient's throat the day before contained diphtheria bacilli. Some thick stringy mucus from nose had been continually coming away during the day; sometimes it was tinged with blood. For temperature and pulse see separate chart, fig. 101.

December 6.—Patient delirious during the night; slept very little indeed. On waking voice reduced to a whisper. Bloody mucus from nose in great quantity.

December 7.—Occasional delirium during the night; patient hardly slept at all. Symptoms much the same as before, excepting that salivation was slightly less, and swallowing a trifle easier.

December 8.—Patient slept fairly well. Membrane diminishing in size, salivation much less. Bloody mucus from nose less in amount.

December 9.—Tonsils smaller, and in consequence patient

was enabled to see, on examining with a looking-glass, that the pharynx was full of gray membranes.

Decemer 10.—Only a small patch on right tonsil. Very little bloody mucus coming from nose.

December 11.—Patient coughed up blood clots continually.

December 12.—Patient still coughing up blood clots.

December 13.—Membranes on tonsils and in pharynx almost gone; some inflammation still visible. Swallowing quite easy.

December 14.—Some inflammation of right tonsil; left tonsil normal. Voice no better (still a whisper).

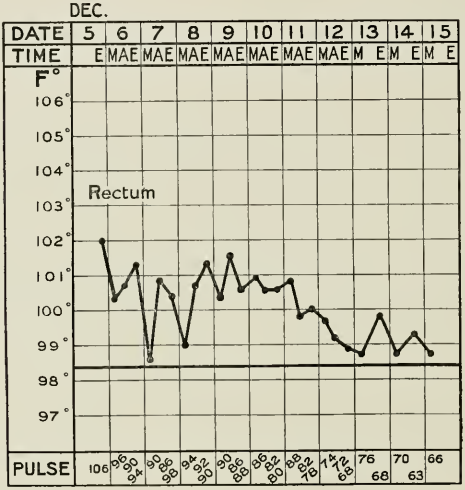

Fig. 101.

December 17.—Patient went out for a short walk (temperature about — 10° C.). Tonsils and pharynx normal in every respect.

December 18.—Patient went out for a drive of one hour.

The treatment was now stopped until December 21, owing to unavoidable circumstances. Patient was treated December 21, 22, 23; then there was another break, and after that the treatment could only be administered about every other day, the actual dates being December 28, 29, January 1, 3, 6, 8, 10, 11, 12; after

the latter date the treatment had to be stopped altogether. Already, on December 21, the voice had begun to come back; after January 12 it continued to improve by itself. By February 10 the voice was normal, and patient could sing as usual. A slight attack of peripheral neuritis supervened, causing no inconvenience beyond a feeling of pins and needles in the hands and feet. After lasting three weeks or so, it disappeared without treatment.

The lungs and heart remained healthy throughout.

Treatment.

At first shakings and vibrations of the larynx, pharynx, and trachea, &c.; frictions over the nerves in these parts, chiefly the superior and recurrent laryngeal, also great occipital and spinal nerves; general treatment for fever. Patient did not remain in bed during the acute stage; he got up every morning and spent most of the day sitting up or walking about. Diet was whatever patient liked, but the amount of food taken was limited, in consequence of the severe pain induced on attempting to swallow. During the convalescent stage, the treatment was specially directed towards stimulation of the nerves of the larynx, and also of the nervous system generally.

No serum was used, the patient absolutely declining any.

March, 1902.—Patient had been very well ever since. In May, 1902, however, an attack of rheumatic fever and erythema set in. The case will be found described on pp. 300 to 308.

Erysipelas Migrans Bullosum.

In the town of Huskvarna several cases of erysipelas occurred during the summer of 1900.

The case described was one of three occurring in the same street.

K. O., female, aged 5, came under the manual treatment on August 29, 1900.

Previous history.—Quite good.

History of present illness.—Everything was apparently normal until the morning of August 26, when, after a restless night,

patient said that she felt ill, and complained of pain in the right inguinal region; she also experienced several shivering attacks. Patient's mother noticed nothing unusual except that the child seemed feverish, and that there was a small scratch on the front of the lower leg at about the junction of its middle and lower third. During the afternoon patient got up, said she felt quite well again, and played about as usual. On getting up on August 27 she felt fairly well; but after a little she experienced further shivering attacks and some fever, and went to bed again at about 11 a.m. The parents observed that around the scratch noticed during the previous day there was a bright red patch about the

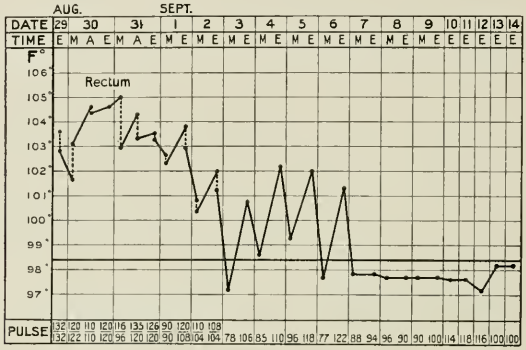

Fig. 102.

size of a shilling. On August 28 the general condition was worse, while the red patch had grown to about three inches in length. On August 29 the general condition was still worse and the red patch still larger, and I was called in.

Examination.—August 29, 6 p.m. Patient in bed, looking very worn out (she had hardly had any sleep for two nights), feverish and shivering. Temperature 103·6°, pulse 132. (For temperature and pulse, see separate chart, fig. 102.) Right lower leg and foot swollen; a large, bright red, inflammatory patch could be seen extending right round the limb from about the scaphoid bone to about two inches below the knee-joint. On the patch many bullæ (some about an inch long) filled with

yellowish exudation; in some places they communicated with one another. In between the bullæ the red area was tense, glazed-looking, and slightly œdematous; the margins were raised and well defined Some œdema of the foot. Great feeling of irritation in the affected area; not much pain in it, but great tenderness to touch. Several enlarged lymphatic glands about the size of a walnut in the right groin; kidney and spleen tender; urine scanty and highly coloured. Heart sounds normal.

After treatment patient went to sleep. Treatment henceforth three times a day.

August 30.—Patient had slept fairly well, better than during any night since the 27th inst.

Morning. The inflammation had spread up about an inch since the previous evening. Treatment administered with increased energy.

Afternoon. The bullæ larger. The inflammation had spread downwards on the foot about half an inch since the morning. The original scratch becoming lighter; the skin around it beginning to get white. The spleen still very tender, but the kidneys not so much. The urine still dark.

Evening. The inflammation still spreading up the leg, but only slowly, the amount being about one inch during the day. There had been an almost entire absence of rigors.

August 31.—Morning. Patient had slept very well during the night. The inflammation had spread externally to about the middle of the external condyle of the femur; internally it had hardly spread at all during the last twenty-four hours; it extended now to the top of the tibia. Some urine passed during the morning was almost normal in colour.

Afternoon. Most of the bullæ opened; no new ones forming. The inflammation had spread externally to the top of the external condyle; internally it had not spread at all during the day.

Evening. Leg in about the same condition as during the afternoon.

Treatment henceforth twice a day.

September 1.—Morning. Patient said that she felt better. Externally the inflammation had spread up nearly to the middle of the thigh; internally it had reached the lower border of the patella. Below it had extended over the whole foot and reached the toes. The whole inflammatory area was, however, less red

and the original scratch much paler; there were some white patches around the middle of the lower leg, and desquamation had set in. No new bullæ. Urine apparently normal. Motion for first time since August 27.

Evening. Patient had consumed some bread and milk during the day.

September 2.—Morning. Patient had slept very well. The inflammation had spread up as far as the middle of the thigh externally, but the redness from the knee upward was fading away; internally the inflammation had not spread at all. The white patches on the lower leg were larger.

Patient ate some bread and butter and drank some milk, and sat up most of the day. No motion.

Evening. The inflammation had not spread any further, and the redness was paler. Some minute new bullæ were forming on the outside of the thigh. Desquamation was proceeding over the greater part of the lower leg, and had begun in the foot.

September 3.—Patient slept very well. The inflamed area reached its maximum size. Above, it extended externally to about the junction of the upper and middle thirds of the thigh, anteriorly to about the middle of the thigh; internally to about the lower border of the patella, posteriorly to about the junction of the lower and middle thirds of the thigh. Below, the inflamed area extended over all the toes.

During the course of the day the patient ate some meat, an egg, and some bread and butter, and drank some milk. One motion.

Evening. Inflammatory area the same size as during the morning; lower leg pale red or white in most places. The original scratch had healed up. Desquamation of the whole lower leg and most of the foot; the latter, however, still swollen.

September 4.—Patient had slept very well. Appetite almost normal. One motion. Patient remained up most of the day. Redness in the thigh continuing to fade. Glands in inguinal region only about half the size they were when I first saw them.

September 5.—Appetite normal. Patient up nearly all day. Redness further diminished; desquamation on the thigh had set in. Foot still swollen.

September 6.—Foot less swollen. Glands in inguinal region no longer swollen. One motion.

September 7.—Improvement continued. Desquamation over the whole of the inflamed area in the thigh.

From to-day onwards patient up all day and walking about as usual.

September 10.—Treatment henceforth only once a day.

September 12.—Only slight redness of the thigh left. Desquamation finished on the lower leg, but still actively proceeding on the thigh and foot. Foot hardly swollen any more. Motion daily since September 8.

September 20.—Desquamation finished. Foot not swollen. Beyond some roughness of the skin, the leg normal. Patient otherwise normal. Treatment finished.

The knee-joints and hip-joints remained unaffected throughout. The ankle-joint was sometimes a little painful at first, but passive flexion and extension, together with traction away from the lower leg, executed through a small, but gradually increasing radius, removed it in every case for a few hours. After September 5 the ankle-joint was not affected.

The heart remained unaffected throughout.

Treatment.

Is conveniently considered in three sections :—

(1) *During the acute stage.*—I treated the fever in the usual way by head exercise, frictions over the spinal nerves, kidneys and spleen, heart and side shaking, stomach exercise, &c. On the leg the movements were executed in a direction *contrary* to the venous and lymphatic flow. I tried by means of centrifugal running vibrations, shakings and gentle kneadings given over the affected part of the leg with a piece of lint interposed between it and my fingers, to prevent the upward spread of the disease and to further the secretion into the bullæ. The consequence was that the inflammation, which during the two days previous to the treatment had spread right up the lower leg, thereafter only spread an inch a day at most. In addition the nerves of the leg were stimulated.

(2) *During the subsiding stage.*—After I had observed that the inflammation had not spread for two days and that the redness was considerably diminished, I used passive movements at the joints of the leg to further the circulation. The intensity of these

movements was increased day by day, and after some time active movements were added (about September 8). In addition nerve frictions on the leg and, of course, the constitutional treatment were used throughout.

(3) *During the convalescent stage.*—Ordinary treatment for convalescence after fever.

The above manipulations on the leg caused but little pain; even this disappeared after the fourth day, and patient began to like the treatment and said she felt it did her good.

I saw patient again on October 6 of the same year (1900). She was very well and the only abnormality was a slight roughness of the skin of the right leg. On October 20, when I again saw her, this had disappeared. During August, 1902, I saw patient for the last time; she had been in excellent health since our last meeting.

Epidemic Cerebro-Spinal Meningitis.

In the town of Huskvarna instances of the above disease were continually being notified; during the summer of 1899 there seemed to be more notifications than usual. The diagnosis of the following case was not absolutely certain; the case might have been regarded as one of another peculiar form of fever which is endemic to the town, a fever with no special symptoms beyond cerebral irritation, lasting from six to eight days and ending by lysis in favourable cases.

Accounts were furnished me of several other children (living within a short distance of the patient whose case I am going to describe) who showed nearly the same symptoms, and who, after lying ill with high fever, great irritation and occasional opisthotonos, died on about the tenth to fourteenth day of illness.

E. S., male, aged $2\frac{1}{2}$ years.

Previous history.—Quite good.

History of present illness.—Patient was seized on August 2, 1899, with sudden fever and pain in the head. A medical man who was called in prescribed antipyrin, and a few days later camphor and antipyrin; no diagnosis was given. On August 18 Dr. A. Möller and I were called in.

Examination.—Patient lay with retraction of the head, photophobia, and great tenderness over the skull and cervical nerves.

Parents said they had occasionally noticed spasms, and once a condition of opisthotonos; none of the latter symptoms were, however, manifested during our visit. Patient seemed quite conscious. Pulse 172, temperature not taken.

Treatment.—Head exercise, spinal nerve frictions, side shaking, stomach exercise and spleen frictions, &c.

August 19.—Morning. Condition about the same. Temperature 103°. Pulse 160. Treatment as before.

Afternoon. Patient worse, semi-unconscious. Pupils somewhat dilated, great tenderness manifested on slight percussion of

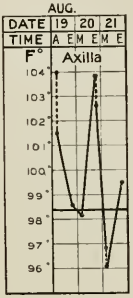

Fig. 103.

the head, and on spinal nerve frictions. Patient occasionally got somewhat opisthotonic and threw himself about. Temperature 104° (axilla), 105° (rectum); pulse 192, irregular (see fig. 103).

Treatment as before. After twenty minutes, temperature (axilla) 102·5°, pulse 178, and patient perspiring very much; after another forty-five minutes, temperature (axilla) 101·5°, pulse 172, and patient perspiring a good deal.

Evening, temperature 98·6°, pulse 90. Treatment.

August 20.—Temperature during the morning was 98·5°, no treatment was, however, administered until the evening; patient irritable; temperature 103·8°, pulse 140. After treatment, temperature 102·6°, pulse 120.

August 21.—Treatment once. Temperature 96·8°, pulse 72. After treatment, temperature 96°, pulse 65.

August 22.—Treatment once during the evening. Patient apparently normal. Temperature 99.4°.

August 23.—Appetite returned; patient sitting up and has been walking about; rather weak, but otherwise normal.

August 24 to 28.—Treatment once daily until the 28th, when it was finished. Patient normal.

October, 1900.—Beyond a slight cold once during the summer child has been very well ever since illness.

Rheumatic Fever and Erythema.

Rheumatic erythema and rheumatic fever, occurring in myself, treated May to July, 1902.

Previous history.—Before marriage my father suffered from rheumatic fever which left a mitral lesion and subsequent aortic incompetence; his brother died of rheumatic fever, and one of my sisters has had the same disease. Personally, I have had the following attacks: 1889, rheumatic fever; 1893, rheumatic erythema; 1895, ditto; 1897, rheumatic fever; 1899, rheumatic erythema twice. Between the above attacks, for all of which the manual treatment was the only therapeutic agent employed, I have enjoyed absolute and complete immunity from rheumatic symptoms of any kind, and have never felt any bad effect from wet feet, being out in all weathers without an overcoat and in general paying no particular regard to damp, rain, or cold.

During the months February to May, 1902, I had an exceptional amount of work to do; I felt that it was becoming too heavy a burden and that I was losing the energy and strength necessary to administer the manual treatment for twelve or more hours a day. During May 10 to 13 I attended almost continuously a patient suffering from typhoid fever; the case is briefly described in the appendix.

History of present illness.—May 13.—Slept from 6 a.m. until 10.30 a.m.; then attended to my practice until 8 p.m. Felt very tired all day.

May 14 and 15.—Felt very tired but worked as usual.

May 16.—Slept very badly and awoke with pain in throat, and difficulty and pain in swallowing. On examination, pharynx, tonsils, uvula and fauces red. I worked all day as usual, although I felt weak and tired. During the evening, temperature 101°, pulse 110 (for temperature see separate chart, fig. 104).

May 17.—Slightly delirious during the night (I easily become so when feverish). Slept very little. Morning, pulse 100. Too ill to attend to my practice. During the course of the day salivation increased (being sometimes blood-stained); bloody mucus on blowing the nose. During the evening erythematous patches, circumscribed, raised, tender, and with a well-defined margin, appeared on the legs. A large, hard, subcutaneous

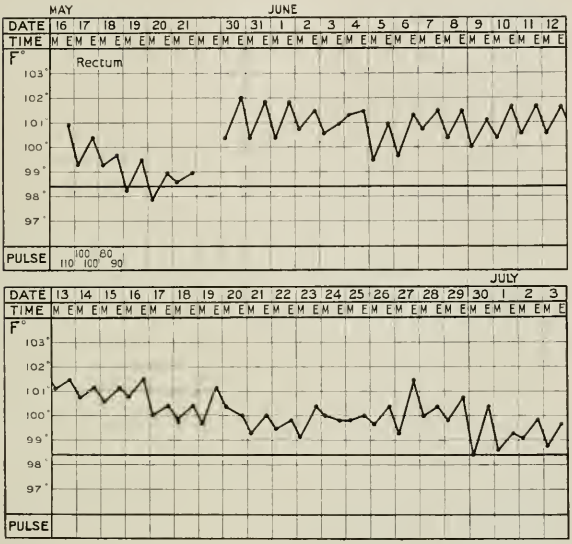

Fig. 104.

swelling was felt on the flexor aspect of the right forearm; it caused little pain, but a good deal of stiffness. Great swelling and redness of the penis, and a soft, well-defined, movable, boggy mass (blood?) manifested itself above the left testicle, inside the scrotum. Throat about the same. Urine thick, no albumen. Pulse 100.

May 18.—Delirious during the night, more so than during the previous night. Slept very little. Throat about the same;

palate very red. Neuralgic pains in finger-tips, back, and legs. Colour of penis darker, and swelling in scrotum smaller. Erythematous patches larger; some new ones also present.

Morning, pulse 80; evening, pulse 90.

May 19.—No delirium during night; slept better. General improvement in all the symptoms: swallowing easier, throat less red, erythematous patches smaller, penis regaining normal size.

Ever since commencement of illness I had got up as usual, and I walked about in my room and outside in the open air whenever I felt able to do so. During the morning of this day I went for half an hour's drive, and during the afternoon played billiards for an hour.

May 20.—Slept well. Much better. Resumed my medical practice (see below).

Afternoon. Swellings of left fifth metacarpal and left cuboid bones, which were hard, rather painful, and very tender. Throat, penis, and scrotum practically normal.

May 21.—Slept very little.

Morning. Worse. Swelling over fifth metacarpal had extended to cover whole of back of hand; new swellings like the last over the right knee and right os calcis. Could not walk without considerable pain. Many new erythematous patches. Throat worse; coughing up blood at intervals.

Evening. Managed to walk about; this improved the pain so much that I was able to go out of doors for half an hour's stroll. All symptoms improved during the course of the day.

May 22.—Slept fairly well. All swellings and erythematous patches better, but a new swelling present in the flexor aspect of the left wrist and the right gastrocnemius. Went out for an hour's walk during the afternoon, then played billiards for an hour.

May 23.—Slept very well. General condition better, but both olecranon processes tender, and both knee-joints stiff. Throat better. I only coughed up very little blood during the day.

May 24.—Better.

May 25.—About the same.

May 26.—Several of my patients (including one case of pulmonary tuberculosis in the third stage), who had been compelled to stop treatment during my illness, having become so much worse for want of it, I was obliged to do some work at my practice, otherwise I feared that some fatal results might occur.

From to-day onwards, until May 29, I worked about two hours in the morning and one hour in the evening.

During the evening of May 29 the symptoms of rheumatic fever set in.

During the course of the afternoon I felt uneasy in the region of the heart. I began to feel very tired indeed at about 7 p.m., and at 8.30 p.m. I went to bed. I then noticed that my heart was beating very irregularly, and that its action was becoming intermittent. In about an hour my condition was such that at every beat my whole body shook, and every third or fourth beat was missed. I also experienced some cyanosis and breathlessness. On auscultating my heart, a loud blowing systolic murmur was heard in the mitral area, also great irregularity in the intensity of the heart sounds. Pulse 130 per minute.

I had administered to me heart vibration and shaking with frictions on the left fourth and fifth dorsal nerves near the spine, together with stomach exercise, the treatment lasting two hours. In consequence my heart was much improved and the intermittency and irregularity almost disappeared, while the pulse was reduced to 108. At midnight I fell asleep.

May 30.—I woke at 3 a.m., with the heart in the same condition as during the previous evening. I underwent the same treatment, and at 4 a.m. the heart was again relieved. Pulse 100. I then slept again until 8 a.m.

8 a.m. Awoke with great stiffness in both legs and right deltoid. From to-day onwards great perspiration during sleep; on waking up I generally found myself drenched with sweat, which had a bad odour. Urine thick, with unpleasant odour; however, it contained no albumen at any time during my illness. Heart better, no intermittencies; more regular, and the murmur I heard yesterday disappeared. Pulse 112. Temperature, see separate chart, fig. 104.

During the evening both feet swelled up and the ankle-joints showed the typical rheumatic fever swelling; they were red, glazed looking, extremely painful and tender; walking was very difficult. Treatment twice a day henceforth (see p. 308).

May 31.—Morning worse; had slept very badly. Feet very bad; walking almost impossible.

Evening. Feet slightly better.

June 1.—Morning. Feet improving, but left knee and left shoulder affected.

Evening. Knee and shoulder better, but left wrist very bad, causing intense pain for two hours or more. Heart quite normal beyond slight acceleration of pulse.

June 2.—Slept about three and a half hours during the night.

Morning. Wrist a good deal better.

Evening. Right wrist bad. Before going to bed I walked round the room three times; my feet were still so bad that this quite tired me out.

June 3.—Morning. Diarrhœa, four motions during the day. Right knee very bad; I could not walk at all.

Evening. Slightly delirious until sleep supervened at midnight.

June 4.—Morning. So far I had generally spent most of the night in an armchair; but on this day I remained in bed until 8 a.m. All affected joints better, and no new ones involved. General feeling of stiffness, and mild neuralgia-like pains in the whole of body.

Evening. Better. Slight diarrhœa from to-day onwards until June 11.

June 5. Slightly delirious during night. Morning. Left foot, left shoulder and left gastrocnemius affected.

Evening. About the same.

June 6.—Morning. Felt worse; ascribed this to the rainy weather, as hitherto it had been very fine. Right knee affected.

Evening. During the course of the day right metacarpal and right second and fourth toes swollen. At about 10 o'clock left acromio-clavicular joint became bad and kept me awake all night.

June 7.—Morning. Left knee and whole of right hand affected.

Evening. About the same.

June 8.—Morning. Right hand and left acromio-clavicular joint worse. Unable to write.

Evening. I resumed smoking (one cigar a day) to-day, having stopped since May 29.

June 9.—Morning. Left knee and right elbow affected.

June 10.—Morning. Spent all night in bed (had not done so since June 4), and did so from to-day onwards. Both knees, both feet and left hand and lumbar portion of erector spinæ affected.

Evening. Left hand very bad; stiffness of all muscles of right side of the neck.

June 11.—Morning. Left hand still bad, but legs nearly well.

Very weak, but I went out of doors for a walk of a few minutes for the first time since May 30.

June 12.—Morning. Right knee bad. During the afternoon I went out for about fifteen minutes.

Evening. Right sciatic nerve and right shoulder affected.

June 13.—Morning. Worse again. Both knees and right shoulder very bad. Unable to walk.

Evening. Very weak all day.

June 14.—Morning. Right hand affected; right shoulder still bad. Able to walk again.

Evening. Diarrhœa stopped.

June 15.—Slept about six hours during the night. Shoulder still bad.

June 16.—About the same. At intervals walked up and down my room for two hours.

June 17.—Slight desquamation of hands and scrotum had been taking place the last week. Right shoulder still bad; during evening right hand and flexors of right forearm affected.

June 18.—Both shoulders and both hands bad. Went out during the afternoon for ten minutes' walk.

June 19.—Right wrist bad.

June 20.—Left wrist and left knee bad; flexors of right fourth finger very stiff and contracted. Diarrhœa again, four motions. Weight in clothes, 85 kilos. (it was 103 in April). Went out for half an hour during the afternoon. Left foot bad during the evening.

June 21.—Left shoulder affected, all other joints well.

June 22.—Left knee and ankle and right elbow affected. Played the piano and sang for an hour during the afternoon.

June 23.—Left knee and left ankle worse. During the evening the latter better, but right ankle bad. No more perspiration during sleep.

June 24.—Right shoulder and right little finger affected. Went out during the afternoon to an adjacent villa about 500 yards off; took forty-five minutes to do so. Had the treatment administered, and walked back in fifteen minutes.

June 25.—Getting stronger. All joints of right arm bad, but legs feeling very well and much stronger. Out for two hours during the day.

June 26.—Hardly any joint affected. I went for an hour's

walk, covering a distance of one and a half miles. During the evening left forefinger very bad.

June 27.—Left internal malleolus bad. During evening right second finger very bad.

June 28.—Finger very bad during night, keeping me awake until 5 a.m. Right malleolus bad during afternoon.

June 29.—Treatment once a day henceforth. Right shoulder bad; malleolus better.

June 30.—Stronger. Left shoulder bad during afternoon.

July 1.—Some pain in both shoulders, but none elsewhere.

July 2.—Left shoulder and left forefinger bad. Went out for ten minutes' walk from one villa to another in pouring rain; the temperature was 9° C., and a fairly strong wind was blowing. Got my shoes and socks damp; no bad results.

July 3.—Left forefinger affected; in evening left second finger affected.

July 4.—Slight stiffness of both shoulders and feet. Stopped taking my temperature.

July 5.—Desquamation of hands and scrotum finished.

July 6.—Went out for a walk for two hours, and played billiards for an hour during the morning, and two during the afternoon; also took a drive for half an hour. Weight in clothes, 87 kilos.

July 7.—Getting stronger every day. Slight stiffness in left foot. Tried to dance (waltz) during the evening, but had to give up the attempt very speedily through giddiness.

July 9.—My appetite for the last four or five days had been enormous; an hour after a heavy meal I felt as if I could eat another.

July 10.—Went out in the rain, and got my shoes and socks damp; no bad effects.

July 13.—Some stiffness in the left shoulder during the last few days was all that remained of my rheumatism. Went for a ride on horseback for fifty minutes. Was caught in the rain, and wetted through to the skin. On coming home changed all my clothes.

July 18.—Took a ride of two and a half hours during the afternoon. On coming home had supper, and then walked about for one and a half hours.

July 23.—During the morning I treated at his home the

patient whose case is found described on pp. 339, &c.; from this day onwards, until August 1, I treated him at his home every morning. Took a ride of three and a half hours during the afternoon.

July 27.—While out riding I got absolutely drenched to the skin. Changed my clothes on coming home.

August 1.—Not yet as strong as I used to be, but otherwise, excepting for slight stiffness of left shoulder, quite normal. Commenced working at my practice again, this occupying me for four to five hours per day. Weight, 95 kilos.

August 2.—Bathed in the neighbouring lake for the first time since taken ill; temperature of water, 14° C. Treatment finished.

August 3.—Took a bicycle ride of twenty-eight miles, the last seven miles of which I accomplished in thirty-five minutes; felt no bad results at all.

Treatment.

During the acute stage I took none of the precautions customary in the treatment of rheumatic fever. I never remained in bed all day, but instead got up and walked into another room if possible, even though doing this, with the help of two other persons, at first caused very acute pain; and every now and then during the course of the day I would make efforts to walk about and move my stiff joints; this *always* after the first seconds diminished the stiffness and pain. As soon as the weather was warm enough I went out of doors.

I slept in a cotton night-shirt between sheets.

My diet during the whole period up to about July 1 (regardless of fever), was about as follows:—Breakfast, two poached eggs with a piece of dry toast, two small pieces of toast with jam or marmalade, and a pint of milk. Dinner, plate of soup, ordinary sized helping of meat with potatoes and vegetables, followed by fruit and cream or some such dish. Supper, meat, potatoes, vegetables and glass of milk. I left off coffee until June 12, after which date, in addition to the food already specified, I took during the course of the afternoon a large cup of coffee with some bread and butter, a few biscuits, &c.

After about July 1 my appetite began to increase, and in a few days became enormous (see July 9). About the end of July it began to diminish and in a week or ten days was normal again.

Gymnastic treatment.—Vibrations over the painful joints and passive movements combined with a great amount of traction—without this they would have been quite unbearable on account of the pain—frictions on the nerves leading to and from the affected parts. General treatment for fever, including heart vibration and shaking. My kidneys were tender during the whole course of the fever.

I made the interesting observation on myself that the inability to move any joint from pain therein did not always depend entirely on the local condition. For example, one day I was unable, on account of the pain induced, to abduct my shoulder through more than an angle of 45°; after treatment of both renal plexuses (which were extremely tender) from the front, I could abduct it through about 135° with very little pain. On another occasion when I could not move my ankle-joint a painful spot was discovered in the great sciatic nerve of that leg high up, the pain in it almost disapppeared after local vibrations and frictions had been administered, and I could perform the movements at the ankle-joint with much less pain.

During convalescence (on and after July 1) the treatment was as follows:—

(1) Sitting arm exercise, PP, AR.

(2) Heave lean standing chest expansion, PA.

(3) Forwards lying back exercise, PP.

(4) Loin lean standing alternate rotation, AR, ringing, PP.

(5) Stretch stride standing bending forwards, PA.

(6) Half lying double arm rolling, PP, bending and stretching, AR.

(7) Half lying double foot rolling, PP, flexion and extension, AR.

(8) Side lying leg lifting, AR, pressing down, PR, side length hacking, PP.

(9) Stretch grasp toe standing hanging, breathing, PA.

(10) Half lying stomach exercise, kidney frictions, PP.

Subsequent history. — August, 1903.—A slight amount of crepitus can be felt when internal rotation of the left humerus is performed; it causes, however, no pain or inconvenience. Apart from this I have enjoyed excellent health ever since, excepting that a slight stiffness in the left knee-joint occurred in January, 1903, for a period of three days; this was removed by appropriate treatment.

Erythema Nodosum.[1]

E. S., male, aged four years, came under the manual treatment on February 26, 1902.

Previous history.—Patient had never been very strong since his birth, and had always been very backward; for example, he did not begin to speak until two and a half years of age.

History of present illness.—During the last fortnight he had been looking rather pale and tired, and had complained of headache and also pains in the knees and right side. On February 26

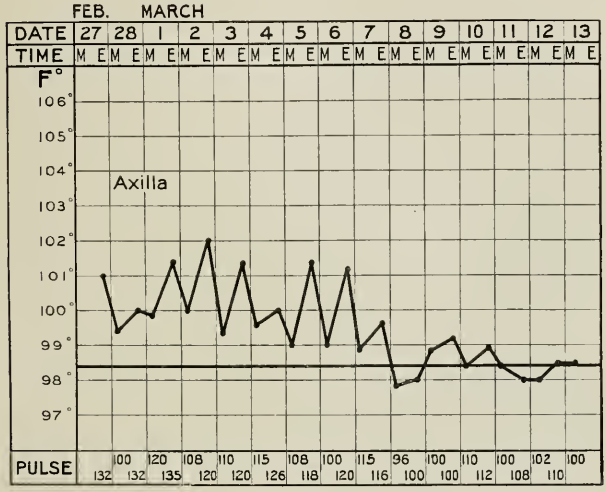

Fig. 105.

patient remained in bed most of the day, complaining of pain in the right side. I saw patient during the evening of the same day.

On examination.—Tenderness on pressure over the lower ribs of the right side, but no pleural friction or abnormal lung sounds. Temperature and pulse normal. I administered a few general strengthening exercises, together with vibrations over the painful area; the pain thereupon disappeared.

[1] I have ventured to include this disease in this chapter, on account of its relationship to rheumatic fever and because the description of a case of the latter involved describing the rheumatic erythema which preceded it.

February 27.—Morning. Patient looked rather ill, but said he had no pain. Great tenderness over the kidneys. Treatment as before.

Evening. Patient complained of pains in the head and legs.

Examination.—Several typical nodular red swellings, numbering about fifteen altogether, were visible on the front of both lower legs; these swellings were oval, elevated, pale red, about a half to one inch in diameter, and painful on pressure. Very great tenderness over spinal nerves and kidneys. Fever (for temperature and pulse see separate chart, fig. 105).

Treatment.—General treatment for fever, including special attention to the spinal nerves and kidneys.

February 28.—Morning. General condition improved.

Evening. No new swellings.

March 1.—New swellings present, one on right knee, two on left knee, and one on right gluteal region.

March 2.—Morning. Swellings on knees disappeared.

Evening. New swelling on right forearm.

March 3.—New swelling on left gluteal region.

March 4.—Swellings on right leg nearly disappeared; those on left leg brownish. Some new swellings on back, which were slightly tender.

Evening. More swellings on back of forearm.

March 5.—New swelling on left forearm and back of hand.

March 6.—Swellings fading. General condition improved; patient looking much better. Less tenderness over kidneys.

March 8.—Swellings disappeared. Some cough.

March 22.—Patient normal. Treatment finished. Patient had undergone treatment once a day since March 13; previously he had been treated twice a day.

During the whole time he was under treatment patient was allowed to be up and to eat what he liked.

The heart remained unaffected throughout.

Subsequent history.—I saw patient again in September, 1902. He had continued well and strong; and both his parents considered him to be in much better health than before his illness.

CHAPTER IV.

DISEASES OF THE RESPIRATORY ORGANS.

Acute Croupous Pneumonia.[1]

In 1847 Branting successfully treated acute pneumonia by gymnastic methods, and his achievement was mentioned by himself in the same year,[2] and later on by Georgii[3] and Hj. Ling[4] (see also Blundell[5]). His attempt was not, however, repeated until Henrik Kellgren made another essay. Even the enthusiastic Neumann[6] makes no mention of using the treatment for such cases, otherwise than by advocating deep respiration, with, perhaps, a few passive movements in addition, to assist the ordinary course adopted. Neumann[7] even wondered whether exudative pleurisy was fitted for gymnastic treatment; from this it may almost certainly be deduced that he would regard acute pneumonia as unfitted.

Henrik Kellgren had as long ago as 1873 been treating acute pneumonia successfully by means of gymnastic methods; and his successes were referred to by Wretlind[8] and Glatter[9]. Wretlind, who learnt the *modus operandi*, was able at a later date to test its efficacy himself[10]. About 1888-1890 several

[1] I have for convenience sake included pneumonia amongst diseases of the respiratory organs instead of placing it under specific infectious diseases.

[2] Address to the graduates of the G. C. I., March 31, 1847.

[3] "Kinetic Jottings," 1880, p. 206.

[4] Branting's "Efterlemnade Skrifter," 1882, p. xxvi.

[5] "Medicina Mechanica," 1852, p. 98.

[6] "Die Athmungskunst," 1857, p. 103, &c.; and Neumann und Schreber, "Streitfragen der Deutschen und Schwedischen Heilgymnastik," 1858, p. 26.

[7] "Referat über das 'Erster Bericht über das Institut für Schwedische Heilgymnastik und Ortopedie zu Wien,'" in *Athenæum for Rationelle Gymnastik*, 1854, pp. 73-79.

[8] "Bref från Dr. Wretlind," in *Hygiea*, Nov., 1872—Feb., 1873.

[9] "Allgemeine Betrachtungen über den Werth der Heilgymnastik," in *Wien. Med. Presse*, 1875, No. 8.

[10] *See* "Om Rörelsekuren eller Kinesitherapien," 1874, pp. 55, 56; "Bokanmälan," &c., in *Eira*, April 15, 1899, p. 203; "Helso-och Sjukvårdslära," 1899, p. 90.

authors[1] made references to the Kellgren treatment of pneumonia. They one and all seemed to think that any gymnastic treatment for this condition was strongly inadvisable. Presumably this view was the outcome of the knowledge of their own inability to do any good with their gymnastic methods. In 1890 Arvid Kellgren[2] spoke with great confidence of the success that he himself, and his brother before him, had had in applying the manual treatment to pneumonia. During the last ten years, as far as I know, nothing has been published on the subject.

The objects of the manual treatment in cases of pneumonia are as follows :—

(I.) To diminish the virulence of the inflammatory process in the lungs by raising the vital activity of these organs and removing the tension by promoting the venous return. This reacts favourably on the heart.

(II.) To treat the constitution as a whole.

This is accomplished by :—

(1) Removing the impediments to respiration which lie in the muscular apparatus. These are found to be :—Contractions in the intercostal muscles over the affected lobe or lobes ; these are removed by administering vibrations and frictions over the contracted areas and frictions on the corresponding dorsal nerves simultaneously (see below). Deficient action of the diaphragm, with or without marked contraction of the abdominal muscles ; this is treated by means of vibration and shaking in the subcostal and suprapubic regions, subdiaphragmatic suction and stomach exercise.

In addition, these impediments can to a great extent be removed by inducing the patient to respire deeply. Small respirations must be taken at first, and the volume then gradually increased ; gentle pressure with one hand on the abdomen during expiration will greatly facilitate the process.

[1] *See* Kleen, "Handbok i Massage," 1888, pp. 222, 223. Gustafson, "Om Massage, dess Utförande och Anvandning," 1888, pp. 44, &c. Nebel, "Bewegungskuren mittelst Schwedischer Heilgymnastik und Massage," 1889, page 184. Dollinger, "Die Massage für Aerzte und Studirende," 1890, p. 158. Hasebroek, "Die Erschütterung in der Zanderschen Heilgymnastik," 1890, p. 1.

See also Hünerfauth, "Handbuch der Massage," 1887, pp. 88, 89. Dolega, "Die Massage, ihre Technik und Anvendung," 1892, p. 102. Reibmayr, "Die Massage und ihre Verwerthung," &c., 1893, p. 75.

[2] "Technic of Ling's System of Manual Treatment," 1890, p. 69.

(2) Removing the impediments to respiration that lie in the lungs themselves. This is partly effected by restoring the muscular mechanism to its normal condition, as described. In addition, vibrations are executed over the affected areas in order to relieve the congestion.

(3) Removing the impediments to respiration that lie in the pleura (if present) by administering:—Vibrations, stationary or running, over the inflamed pleura; this will promote the venous and lymph flow and remove the contraction of the intercostal muscles; the latter will react favourably on the former. Frictions on the intercostal nerves supplying the affected spaces. Deep respiration; although one or two of these cause an increase in the pain, yet several taken successively nearly always diminish it for some hours (see expansion, pp. 124, &c.).

(4) Stimulating the nervous elements of the lungs. Frictions are executed over the dorsal nerves near the spine (see p. 164); the nerves on the affected side over the affected lobes are always tender. Frictions should be executed especially over those nerves that supply the intercostal spaces where contractions exist, as already described.

(5) Guarding against heart failure by diminishing the resistance in the lesser circulation (as mentioned already), and by quieting its over-excited action through heart vibration and shaking, and reflexly through stomach exercise. Frictions over the left fourth and fifth dorsal nerves near the spine in addition may be executed while applying the local heart treatment. Better cardiac action brings in its turn improvement in the lesser circulation.

(6) Treating the constitution as a whole by means of head exercise, cervical, dorsal, and lumbar nerve frictions, kidney frictions, &c. I must here mention that, in two cases of pneumonia I have treated, the kidney region of the affected side was much more tender to touch than that of the opposite side. Stomach exercise should also be administered. It acts beneficially by reflexly quieting the heart's action (as already mentioned) and acting depletingly on the lungs.

The objects of the manual treatment during convalescence from pneumonia are as follows:—

(1) To improve the lungs by means of chest clapping, side shaking, &c., and by means of active respiratory exercises.

(2) To stimulate the nervous elements of the lungs by means of dorsal and intercostal nerve frictions.

(3) To improve the constitution as a whole.

K. S., aged 33, coachman, moderate drinker of alcohol, came under the manual treatment on March 28, 1900.

Previous history.—Patient always well and strong with the exception of a bad attack of pneumonia ten years previously.

History of present illness.—Patient said he caught a chill on March 24, and felt rather weak for the next few days. On March 27 he drove in from Sanna to Jönköping, distance about three miles, but felt very weak, had a shivering attack of ten minutes' duration, and was obliged to go home at once and take to bed.

March 28.—1.30 p.m. Patient in bed; complained of severe headache. Temperature 104·9°, pulse 140. Nothing abnormal in lungs or heart. I administered the ordinary treatment for fever. During the evening I paid a second visit. Patient was drowsy, and I did not examine his lungs or heart. I administered a short treatment, and he said he would go to sleep. Temperature 104·2°, pulse 120.

March 29.—Patient had slept badly. High fever. Temperature 105·5°, pulse 122, respiration 41. The left side of the thorax did not move quite so well as the right during respiration, which was accelerated and shallow. No pain on deep respiration. There was tenderness over the fourth to eleventh dorsal nerves near the spine on the left side; the intercostal muscles in the fifth to ninth spaces were contracted. On percussion there was some dulness over the fourth to tenth ribs posteriorly and sixth to eighth laterally. The breathing over this area was harsh vesicular, and some fine crepitations were audible. No sputum. Treatment four times during the day. For temperature, respiration and pulse see separate chart, fig. 106.

March 30.—There was absolute dulness on percussion over the left lower lobe from the fourth to eleventh ribs posteriorly, and sixth to ninth ribs laterally. The breathing in this area was tubular, with no crepitations unless on very deep inspiration, and the vocal fremitus and resonance in it were markedly increased.

Treatment three times during the day. During the evening frothy sputum.

March 31.—Patient experienced continued great pain in the left half of the thorax over about seventh and eighth ribs in the mammary line, and laterally over the fifth to seventh ribs. The sputum very thick and here and there streaked with blood.

April 1.—General condition about the same as during the previous day. The spinal nerves, as before mentioned, still very tender. Treatment three times.

April 2.—Patient wandering in his mind during most of the day. Sputum now partially greenish, and streaked with blood. Treatment five times. During the evening patient ate a little soup. Since March 28 he had taken hardly anything except a little milk.

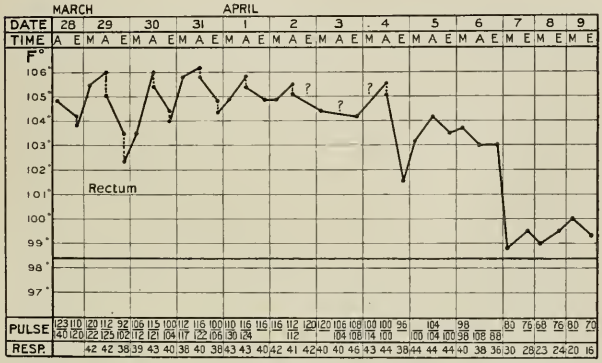

Fig. 106.

April 3.—Patient wandering in his mind during most of the day. The lung symptoms about the same, but less pain in the side. Treatment six times.

April 4.—Pulse dicrotic. Herpes labialis. ·05 per cent. albuminuria. Patient wandered in his mind until about 6 p.m.; then he recovered his senses, and temperature, respiration, and pulse all sank somewhat. (Pseudo-crisis.) Treatment six times

April 5.—Temperature higher, pulse and respiration more rapid again. Patient clear in his head during most of the day, excepting the morning. ·05 per cent. albuminuria. The temperature could be taken again properly; on April 3 and 4 there

had been great difficulty, as patient would not keep still. Treatment four times.

April 6.—Patient did not wander in his mind at all. ·1 per cent. albuminuria. Patient felt very sleepy at 5 p.m., and began to perspire very much indeed. Crisis commenced. Treatment three times.

April 7.—Patient slept almost without stopping until 8 a.m. He then woke up feeling well, but very weak. He perspired most profusely during the night; his clothes were changed several times for the sake of dryness, but the process did not wake him.

Morning. Temperature 98·8°, pulse 80, respiration 30. The left side moved somewhat with respiration; there was no dulness on percussion, but many sounds were to be heard over the affected area, varying from fine crepitations to coarse ones. Appetite good. Patient remained in bed all day. Treatment twice. The spinal nerves already referred to still very tender.

April 8.—Some fine crepitations to be heard, otherwise nothing marked. Patient got up and said that he felt well, though weak. He had, however, sufficient strength to walk about a good deal.

April 9 to 10.—Treatment twice. Fine crepitations still audible; patient coughed up some white frothy stuff.

April 11.—Patient went out of doors for a few minutes. Treatment once. Lungs normal. No crepitations; no sputum.

April 12 to 15.—Treatment once daily. Patient went out during the 15th for half an hour.

April 16 to 22.—Treatment once daily. During the 22nd patient did several odd pieces of work, such as carrying window-frames about, taking them out, &c.

April 29.—Patient drove out for one hour.

May 1.—Patient drove out one and a half hours in a snow-storm. He said that he felt very strong.

May 9.—Patient quite well and strong. Present weight, 74½ kilos. He stated that just before his illness he weighed 74 kilos. Treatment finished.

July, 1903.—Patient had been quite well ever since his illness.

Acute Bronchitis.

Mrs. L., aged 27, came under the manual treatment on February 28, 1900.

Previous history.—Patient had for the last ten years had a

fairly well compensated mitral incompetence, following on rheumatic fever.

History of present illness.—Patient was attacked by acute bronchitis on February 26, 1900; she could not assign any cause for the attack. The onset was fairly sudden, and was marked by a rigor. Fever set in, with a sense of oppression in the chest, which soon gave way to pain behind the sternum, and a cough came on which increased the pain. Pains in the right side, arms, and legs also made their appearance. February 27.—General condition worse; secretion from bronchi commencing. February 28.—Patient being still worse, I was called in.

Examination.—Patient complained of headache, fever, pains in the chest, arms, and legs, difficulty in breathing, and severe cough. She had been coughing up lumps of yellowish matter all day. There was no percussion dulness. On auscultation, loud bubbling sounds were heard all over the chest, and these were audible, even without the aid of a stethoscope, at a distance of several feet. There was great tenderness between the scapulæ. Temperature 103·5°, pulse 110, respiration 40. Treatment forthwith administered.

March 1.—Treatment twice a day henceforth.

Morning. Temperature 103·2°, pulse 103, respiration 36. Headache better.

Evening. Temperature, 104·2° and 103·7°, pulse 117 and 100, respiration 42 and 42, respectively before and after treatment.

March 2.—Morning. Patient better. Temperature 102·8° and 102·4, pulse 100 and 96, respiration 38 and 36, respectively before and after treatment.

Evening. Less bronchial secretion. Temperature 103·3° and 101·6°, pulse 96 and 96, respiration 36 and 38, respectively before and after treatment.

March 3.—Patient much better; she got up for an hour or so during the afternoon, feeling, however, very weak. Less bronchial secretion; hardly any headache; no pains in arms or legs; difficulty in breathing only when patient out of bed.

Morning. Temperature 101·3° pulse 100, respiration 28.

Evening. Temperature 102·8° and 101·7°, pulse 100 and 96, respiration 33 and 30, respectively before and after treatment.

March 4.—Patient up during most of the day. Appetite returned; ordinary diet resumed.

Morning. Temperature 100·6°, pulse 84, respiration 23.

Evening. Temperature 100·8°, pulse 93, respiration 28.

March 5.—Patient stronger, and up all day. Treatment once only during the morning. Hardly any bronchial secretion. Temperature 100·4°, pulse 100, respiration 20.

March 6.—Patient normal, excepting for slight weakness. Treatment during the afternoon. Temperature 99·7°, pulse 88, respiration 20.

March 7.—Patient normal. Temperature 98·6°, pulse 68, respiration 18. Treatment for the last time.

June, 1902.—Patient still feeling quite well.

Treatment.

Head exercise, thorax vibration and shaking, heart vibration and shaking, side shaking, practising deep respiration, stomach exercise, vibration over the bladder, frictions on the spleen, kidneys, and spinal nerves, specially the interscapular. From March 5 onwards chest clapping and some active breathing exercises in addition.

Acute Pleurisy.

Neumann[1] was doubtful whether exudative pleurisy should come under gymnastic treatment, as advocated by Melicher.[2] Hartelius, in 1864,[3] stated that "it is, of course, not acute pleurisy, but only the more or less severe sequelæ that can be treated by gymnastics"; and, in 1865,[4] he further stated that gymnastics can effect nothing if an exudation remained, together with great weakness and a cachectic condition. In his handbook[5] he repeated his dictum that gymnastics can only be employed for pleurisy as an after-cure.

The manual treatment for acute pleurisy during the acute stage is as follows:—

[1] Quoted on p. 311.

[2] *Cf.* Hj. Ling, in Branting's "Efterlemnade Skrifter," 1882, p. xxvi.

[3] "Om Sjukgymnastiken vid Gymnastiska Central Institutet under år 1863," 1864, p. 46.

[4] "Gymnastiska Iakttagelser," 1865, p. 78.

[5] "Lärobok i Sjukgymnastik," 1870, p. 245; 1883, p. 258; 1892, p. 251.

(1) *Local.*—This has already been described under pneumonia (see p. 313).

(2) *General, i.e.*, treatment of the constitution as a whole by means of general treatment for fever.

During the convalescent stage it is as follows:—

(1) *Local.*—Movements to promote the circulation of the blood and lymph in the pleura, *i.e.*, passive manipulations such as vibrations, hackings, running vibrations, &c., over the affected parts of the pleura; passive trunk flexions; active trunk flexions, unresisted or resisted.

(2) *General.*—Treatment on the lines of "general treatment for convalescence."

H. S., male, aged 15, came under the manual treatment on the morning of November 19, 1900.

Previous history.—Quite good.

History of present illness.—On November 18 patient was suddenly attacked with rigors, pain in the right side, fever and loss of appetite; he remained in bed all day, and ate nothing; and during the ensuing night slept very badly. During the following morning I was called in.

Examination.—Patient complained of pain in the right side over the fourth to seventh ribs from about the sternum to the anterior axillary line. Coughing and attempting deep inspiration made the pain much worse, so that patient felt as if a knife were cutting him. The abdomen did not move at all with respiration, and the right half of the thorax only moved in its upper part. The movements of the left half of the thorax were normal. The intercostal muscles were contracted over the painful area. Auscultation, pleural friction over the fifth and sixth interspaces in about two inches of their course; breathing harsher in type, expiration more audible than normal; fine crepitations. Urine high-coloured. Temperature 103·6°, pulse 115. After treatment less pain, temperature 103°, pulse 110.

Evening of same day. Pain in the right side worse than during the morning. Great tenderness to touch over the fifth to seventh dorsal nerves on the right side. Pleural friction more intense on auscultation, and perceptible to the fingers. Urine still darker than during the morning. Temperature 103·4°, pulse 104. After treatment temperature 103°, pulse 102.

November 20.—Morning. Patient had slept fairly well. Still a good deal of pain in the side, but no pleural friction to be detected on auscultation. Patient coughing up frothy stuff streaked with blood. Urine very dark. Temperature 104°, pulse 102. After treatment, pain very much less, temperature 103·5°, pulse 102.

Evening. Patient still coughing up frothy stuff streaked with blood, but pain in side much less, and general condition improved. Respiration partly abdominal. Patient had begun to eat again. Temperature 102·2°, pulse 88.

Treatment morning and evening.

November 21.—Morning. Patient had slept very well. No more cough ; very little pain in right side. Urine clear. Temperature 99·2°, pulse 60.

During the course of the day patient got up and felt tolerably well, although weak.

Evening. Only slight pain on deep respiration. Temperature 100·2°, pulse 58.

Treatment morning and evening.

November 22.—On deep respiration patient said that he felt a little uncomfortable in his right side. Respiratory movements normal. No fever ; temperature and pulse normal. Treatment once. Patient up all day.

November 23.—No treatment.

November 24.—No pain. From to-day onwards patient was treated once a day, and walked to and from his home to my house, a distance of two-thirds of a mile each way.

November 25.—Slight pain returned in side. It finally disappeared after this day's treatment.

November 26.—Patient said that he felt much stronger.

November 27, 28 and 29.—Treatment. On 29th, patient went back to his work as engraver at Huskvarna factory, and worked for five and a half hours.

November 30.—Patient worked at factory all day, excepting for one and a half hours during which he walked to my house, was treated, and walked back again.

December 2.—Patient was normal, and said that he felt quite strong. Treatment for the last time.

October, 1902.—Patient had been very well ever since his illness.

Chronic Pleurisy.

The treatment of both chronic pleurisy with effusion and chronic dry pleurisy is essentially the same, the objects being to remove the effusion and gently break down the adhesions, and thereby restore the normal functions of the pleura and respiratory apparatus.

This is effected by means of :—

(I.) *Local treatment, which comprises* :—

(1) Stationary vibrations, shakings, hackings, &c., over the affected areas.

(2) Running vibrations and frictions from before backwards in the affected intercostal spaces.

(3) Nerve frictions on the posterior divisions of those spinal nerves which correspond to the affected spaces.

(4) Respiratory exercises.

(5) Lateral trunk flexions, active as well as passive.

(6) Shaking or vibration over the bladder.

(II.) *General treatment* of the constitution as a whole.

In his handbooks of 1896,[1] 1899,[2] 1902,[3] and 1903,[4] Wide makes the astounding statement that he was the operator to "introduce gymnastics into new spheres, as, for example, in the after-treatment for acute pneumonia and pleurisy." This assertion can only be explained by a complete ignorance on his part of all the literature on Swedish gymnastics, for cases of this kind have been written about ever since 1846. Wide must have overlooked even the productions of Dr. Sätherberg, formerly head of the Gymnastic Orthopædic Institute in Stockholm, whose very successor Wide himself is at present.

The following are some of the older works (up to 1870) that mention either convalescence from pneumonia or pleurisy, chronic pleurisy and scoliosis arising from the latter, as having been treated by gymnastic methods.

From the Gymnastic Orthopædic Institute :—

Sätherberg. "Gymnastiskt-Ortopediska Institutet i Stockholm," 1850, pp. 4, 5, &c.

[1] "Handbok i Medicinsk Gymnastik," 1896, p. 210.
[2] "Handbook of Medical Gymnastics," 1899, p. 197.
[3] "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 188.
[4] "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 203.

Sätherberg. "Årsrapport från Gymnastiska Ortopediska Institutet för år 1857," in *Hygiea*, November, 1858, p. 641.

Sätherberg. "Gymnastik och Ortopedi," 1862, p. 4.

Sätherberg. "Gymnastiska Ortopediska Institutet, dess Ställning och Verksamhet," 1868.

From the G. C. I. and other practitioners of Ling's system:—

Branting. Speech to the graduates delivered on April 1, 1846, quoted by Georgii, "Kinésithérapie," 1847, p. 99.

Riecke. "Beiträge zur Heilung der Empyems und der Scoliose," in v. Walther's und v. Ammon's *Zeitschr. f. Chir. und Augenheilk.*, vol. vi., 1846, part 2.

Rothstein. "Die Gymnastik nach dem Systeme des Schwedischen Gymnasiarchen P. H. Ling," 1847, p. 93.

Richter. "Organon der Physiologischen Therapie," 1850, p. 201.

Branting. "Efterlemnade Skrifter," 1882, in section devoted to the year 1851, pp. 21, 23, 62, &c.

Neumann. "Die Heilgymnastik," 1852, p. 287.

Melicher. "Erster Bericht," &c., 1853.

Eulenberg. "Die Schwedische Heilgymnastik," 1853.

Melicher. "Jahresbericht für 1853," 1854.

Richter. "Bericht über neuere Heilgymnastik," in Schmidt's *Jahrbücher*, 1854, vol. lxxxii., pp. 248, 251.

Friedrich. "Die Heilgymnastik in Schweden und Norwegen," 1855, p. 41.

Neumann. "Die Einführung der Heilgymnastik in Lazareth und Klinik," in *Athen. f. Rat. Gym.*, vol. ii., 1855, part 1, p. 1.

Melicher. "Jahresbericht für 1854," 1855.

Weber. "Einige Worte über den Werth . . . der Heilgymnastik," in *Athen. f. Rat. Gym.*, vol. iii., 1856, part 2, p. 89.

Melicher. "Jahresbericht für 1855," 1856.

Melicher. "V. Jahresbericht für 1856 und 1857," 1858.

Richter. "Bericht über neuere Heilgymnastik," in Schmidt's *Jahrbücher*, 1858, vol. xcviii., p. 126.

Steudel and Gärtner. "Dritter Bericht über das Heilgymnastische Institut in Stuttgart," 1858, p. 23.

Ulrich. "Jahresbericht über das Institut für Schwedische Heilgymnastik in Bremen," 1858, pp. 38 & 64.

Melicher. "VI. Jahresbericht für 1858 und 1859," 1860.

Richter. "Grundriss der Inneren Klinik," 1860, vol. ii., pp. 239, 248, 252.

Branting. "Årsrapport . . . år 1861," p. 30.

Branting. "Årsrapport," &c., 1863, pp. 29, &c.

Nycander. "Aarsberetning fra Institutet för Svensk Medicinsk Gymnastik i Kjöbenhavn," 1863, pp. 14-16.

Hartelius. "Om Sjukgymnastiken vid Gymnastiska Central Institutet under år 1863," 1864, pp. 44, 78.

Hartelius. "Gymnastiska Iakttagelser," 1865, p. 77.

Hartelius. "Årsberättelse i Sjukgymnastik," &c., in *Svenska Gymnastik-Förenigens Tidskrift*," 1866, p. 49.

Hartelius. "Gymnastiska Notiser," 1870, p. 6. "Lärobok i Sjukgymnastik," 1870, p. 245.

Case 1.

E. M., female, aged 26 years, domestic servant.

Previous history.—Quite good.

History of present illness.—Patient on October 19, 1901, was attacked with violent stabbing pains in the right side, accompanied by fever, rigors and perspiration. She managed to keep up for a week, but was then compelled to take to her bed. No medical aid was summoned until seven weeks after the onset of the illness; this was in part due to the fact that patient lived in the country many miles away from any member of the profession. At last, when aid arrived, a diagnosis of effusion into the right pleura was made, and patient was recommended to the hospital in Jönköping. Two days afterwards she was admitted to the latter institute, and she remained there until January 16, 1902. Five punctures were made at different times into the right pleura, but no effusion was found. Patient slowly became better, and on leaving she was recommended gymnastic treatment.

Patient consulted me on February 3, 1902.

Examination.—Patient complained of a continued sense of constriction and pain in the whole right side of the thorax. This pain was only slight on ordinary respiration, but deep respiration very much aggravated it, so that sharp stabbing pains were experienced. She also complained of constant pain down the right side of the spine, from the second to the twelfth rib, about an inch from the middle line.

The right side of the thorax moved much less with respiration than the left; on deep inspiration the distance from the xiphister-

num horizontally backwards to the spinous process of the corresponding vertebra was 36½ cm. on the right side, as compared with 39 cm. on the left. On percussion of the right side there was dulness, almost absolute, posteriorly from the third to the tenth ribs for about three to four inches external to the vertebral column, and anteriorly in the clavicular and mammary regions. Over the rest of the right thorax the note was partially impaired. Pleural friction could be heard almost everywhere in the right thorax, the amount varying from "creaking leather" sounds to "fine friction." In some cases the friction was palpable. The breath sounds and vocal resonance were diminished over the whole right thorax, and in places the former were either inaudible or else masked by pleural friction.

Treatment.

(1) Heave grasp standing chest clapping, side shaking, PP.

(2) Half lying double arm rolling, PP, bending and stretching, AR.

(3) Stretch stride standing bending forwards, PA, with back hacking, PP.

(4) Forwards lying back exercise, PP.

(5) Hip lean walk standing lateral flexion, PR, extension, AR.

(6) Loin lean stride standing alternate rotation, AR, ringing, PP.

(7) Right stretch left side lying running nerve frictions, including the intercostal nerves, PP, side length hacking, PP.

(8) Walk standing double arm circling, breathing, PA.

(9) Half lying vibration over the right thorax, especially the most affected parts or where pain was felt most, with running vibrations along the intercostal spaces, PP.

(10) Half lying stomach exercise, PP.

(11) Stretch grasp toe standing hanging, breathing, PA.

Progress.—Pain was experienced by the patient in various parts of the right thorax for the following three weeks, the localities of the pain generally differing from day to day.

February 20.—The pain along the side of the spine had disappeared.

March 4.—Patient very much better. Pleura normal except over third to fifth interspaces under mammary gland where

friction was heard; the friction was, however, not loud, and normal breath sounds were audible in this area. On deep inspiration, circumference of right lung, 38 cm., left lung, 39½ cm.

April 4.—Pleura normal, no friction. On deep inspiration, circumference of both sides, 40 cm. Treatment finished.

During July, 1902, I heard that patient was still keeping quite well.

Case 2.

A. F., male, aged 45, worker in an iron factory.

Previous history.—Very good indeed.

History of present illness.—Patient went through an attack of pleurisy with effusion, which commenced December 24, 1901; he stated that he had fever for sixteen days, and was kept to bed for a month. He was then allowed up, but was so weak that he could not walk. About the middle of February, 1902, he was allowed out of doors for five minutes a day, during the next week for ten minutes a day, and so on, gradually increasing the time; by March 8 he was strong enough to take a walk of two miles. On March 20 his medical man recommended him to me for gymnastic treatment.

Examination.—March 21, 1902. Patient complained of continued feeling of heaviness and tiredness in the left half of the thorax, and difficulty on respiration. No pain on deep respiration, but only a sense of uneasiness in the left side. Intercostal spaces of left side of thorax somewhat indrawn, and the whole left side remained immobile, even during deep respiration. Circumference of left half 41 cm., both during deep inspiration and deep expiration, as compared with 44 cm. and 42½ cm. on the right side. Posteriorly, absolute dulness on percussion from the fourth rib down to the base of the lung, and the same in the axilla; anteriorly, the dulness extended round so as to blend with the cardiac dulness. Vocal fremitus and resonance almost absent over this area; no breath sounds heard over it. Pleural friction in third and fourth interspaces posteriorly, in fifth and seventh laterally, and fifth and sixth anteriorly. Some crepitations at both apices. Heart sounds closed, though muffled in the mitral area. General weakness and emaciation. Appetite poor. Tendency to free perspiration.

Treatment.

(1) Heave grasp standing chest clapping, PP, side shaking, PP.

(2) Hip lean walk standing lateral flexion, PR, extension, AR.

(3) Half lying double arm rolling, PP, bending and stretching, AR.

(4) Forwards lying back exercise, PP.

(5) Left stretch right side lying running nerve frictions, PP, side length hacking, PP.

(6) Ride sitting alternate rotation, AR, ringing, PP.

(7) Half lying vibration over left half of thorax, and running intercostal vibrations, PP.

(8) Half lying stomach exercise, vibration over the bladder, PP.

(9) Stretch grasp toe standing hanging, breathing, PA.

Progress.—March 22. The left side beginning to move with respiration, and patient stated that he breathed more easily. Deep inspiration, however, had for the last week caused stabbing pains in the left side of the thorax, the site of these pains varying from day to day.

April 10.—The left side moved fairly well with respiration, the circumferences being 41 cm. and 42½ cm. as compared with 41 cm. and 41 cm. on March 21. Partial dulness posteriorly from the seventh rib downwards; laterally the note somewhat impaired below the seventh rib; anteriorly no dulness. Vocal fremitus and resonance more marked in these areas than before, and pleural friction now audible all over them. On deep respiration the inspiratory breath sounds audible. The crepitations at the apices had disappeared. No muffling of the sounds in the mitral area. General condition considerably improved; patient stronger, and reported his appetite to be once more normal.

May 4.—Patient had commenced to work again four hours a day in the factory.

May 15.—Treatment finished. The stabbing pains referred to above almost disappeared. No difficulty in breathing, except after considerable exertion. Expansion of left side very good, the circumferences being 42 cm. and 44 cm., as compared with 43 cm. and 46 cm. on the right side. Posteriorly and laterally the partial dulness referred to on April 10 had almost disappeared, the note being but slightly impaired. Vocal fremitus and resonance posteriorly almost as plain as on the right side. Some pleural

friction heard posteriorly, but causing the patient no inconvenience beyond a sense of uneasiness from time to time. Breath sounds normal. Patient said that he felt quite strong again. He proceeded to resume his full day's work (nine hours a day) at the factory.

August 16.—I saw patient again. He had been working full time ever since he finished the treatment. The slight feeling of uneasiness referred to on May 15 was still occasionally felt, otherwise no abnormal subjective sensations. Condition of pleura showed no further change.

Case 3.

E. J., aged 16, domestic servant, came under the manual treatment on July 7, 1902.

Previous history.—Not very good. Patient had never been very strong. She had rheumatic fever about four years previously, which left her with a mitral incompetence. This, however, was quite well compensated, and had not given her any trouble.

History of present illness.—Patient was attacked with pleurisy in the right side on May 22, 1902. Her medical man never said anything about there being an effusion, and no punctures were made. She was kept in bed for two weeks, after which she was allowed up a little. At the end of a month she had so far recovered as to be allowed out of doors, although she was still weak, and had a great sense of oppression and tiredness in the right side. Her condition improved only very slightly after that until July 7, 1902.

Examination.—Patient thin and pale, complaining of weakness and continued feeling of heaviness and tiredness in the right side. The right side moved only slightly with respiration; on deep expiration the circumference was 32 cm., and on deep inspiration 32½ cm., as compared with 31 cm. and 33 cm. on the left side. There was absolute dulness on percussion posteriorly from the fourth rib downwards, and in the axilla from the sixth rib downwards, the area of dulness fading off on proceeding forwards, and terminating about an inch in front of the anterior axillary line. Pleural friction was audible along the limits of the dull area, but not in the area itself, where there was complete absence

of vocal fremitus, vocal resonance and breath sounds. There was no ægophony.

Treatment.

(1) Forwards lying back exercise, PP.

(2) Heave grasp standing chest clapping, PP, side shaking, PP.

(3) Stretch side standing bending sideways, PA, given with hacking over the affected area on the right side, PP.

(4) Reach grasp stoop fall standing double elbow flexion and extension, PA, with back hacking, PP.

(5) Stretch half lying running nerve frictions, including the intercostal nerves, PP, side shaking, PP.

(6) Half lying chest vibration given specially over the affected areas, PP.

(7) Half lying stomach exercise, shaking over the bladder, kidney frictions, &c., PP.

Progress.—Patient began after a few days to feel sharp stabbing pains in the right side of the thorax, the site of these varying from day to day. Pleural friction was audible over the whole dull area on and after July 20.

August 7.—The dulness had diminished in extent, the upper limit being the sixth rib posteriorly, and it was now only partial, not complete. There was no dulness in the axilla. Pleural friction and faint breath sounds were audible in the whole dull area, and also in the axilla where the dull area used to be.

August 21.—The expansion of the right side of the chest was as good as that of the left, the figures being $32\frac{1}{2}$ cm. and $34\frac{1}{2}$ cm. on both sides on deep expiration and deep inspiration respectively. A slightly dull area about three inches wide was found posteriorly from the eighth rib downwards; the vocal fremitus and resonance were heard almost as well here as in the corresponding area on the left side; the breath sounds were, however, somewhat fainter on the right side. There was no more pain or pleural friction anywhere. Patient looked much better, and said that she felt quite well and strong. Although not quite cured, patient had to finish treatment, otherwise she would have lost her situation.

Further progress unknown.

Case 4.

S. W., male, aged 26, worker in Huskvarna factory, came under the manual treatment on April 4, 1902.

Previous history.—Patient had never been very strong; had always had a narrow chest and been very thin.

History of present illness.—During January, 1897, patient suffered an attack of pleurisy in his left side, which confined him to his bed for a month. The medical man who attended him made no punctures, and patient was never told whether he had an effusion or not. The result of the pleurisy was that the left side became indrawn and concave at its lower part, and a scoliosis resulted. When patient was allowed up he was very weak, and it took three months before he was strong enough to resume work again. He underwent two months' gymnastic treatment according to Ling's system, but stated that the course only did him very little good. Since then (June, 1897) his condition had remained the same.

Patient consulted me on April 4 for catarrh of both lungs (non-tubercular). I considered the lung condition amenable to the manual treatment, and recommended patient to take a longer course of treatment than was necessary for the cure of his lungs, in order to obtain an amelioration in the condition of his pleura and in his scoliosis.

Examination.—Patient had suffered from a good deal of cough for the last three months, and had been perspiring at night and getting thinner during the last two months, and he had been getting progressively weaker, having to cease work at the end of February, 1902. He complained of a continued heavy feeling in the left side of the thorax low down, with stabbing pains if he either bent his trunk over to the right side or stretched up. No pain was, however, felt in the area mentioned during deep inspiration.

There was considerable emaciation of the whole body. A C-shaped scoliosis with the concavity to the left commenced at the first dorsal vertebra above and extended to the first lumbar vertebra below. A straight line drawn between the spines of these vertebræ was 5 c. distant from the spines of the fifth and sixth dorsal vertebræ, where the point of maximum curvature is situated. The muscles on the concave (left) side of the curvature were hard and contracted, those on the convex (right) side soft and flabby. By means of voluntary effort the curvature could be slightly straightened so that its maximum point was only about $4\frac{1}{2}$ c. from the line drawn between the spines of the first dorsal and first lumbar vertebræ.

Left side of the thorax. The whole side was markedly concave, the point of maximum curvature being at the sixth, seventh and eighth ribs in about the mid-axillary line. Over an area here measuring about 5 inches from above downwards and 4 inches from side to side the intercostal spaces were indrawn and felt very resistant. There was absolute dulness on percussion here, except just at the edges of the area, where it was partial. No breath sounds were audible except at the edge, where they could be faintly distinguished, and slight pleural friction could be detected here and there on deep inspiration.

Fig. 107.

Fig. 107 shows a photograph of the patient taken before the first day of treatment.

There was no dulness on percussion of the apices, but fine and medium crepitations were audible at both apices and anteriorly downwards as far as about the fourth rib on either side.

The rest of the lungs were normal. The respiration was 33 per minute.

The heart was displaced to the right; the apex beat could be seen and felt in the fourth interspace 1 inch to the right of the nipple line; the dulness on percussion extended to $1\frac{1}{2}$ inches to

the right of the sternum. The heart sounds were normal, but the cardiac beat was accelerated; the pulse rate when patient stood up was 116 per minute.

Patient's appetite was poor. He had a motion daily.

Treatment.

(1) Heave grasp standing chest clapping, side shaking, PP.

(2) Loin lean stride standing alternate rotation, AR, ringing, PP.

(3) Forwards lying back exercise, PP.

(4) Arch forwards lying head flexion, PR, extension, AR.

(5) Stretch stride standing bending forwards, PA, given with back hacking, PP.

(6) Half lying double arm rolling, PP, bending and stretching, AR.

(7) Left hip lean walk standing lateral flexion, PR, extension, AR.

(8) Ride sitting trunk flexion, PR, extension, AR.

(9) Half lying vibration over the affected pleura, running intercostal nerve frictions, side shaking, PP.

(10) Stretch grasp toe standing hanging, breathing, PA.

(11) Half lying stomach exercise, shaking over the bladder, PP.

(12) Half lying trunk stretching, PA, right mid-dorsal spinal muscle frictions, PP.

Progress.—April 5. More pain than usual in the area of dulness in the left side.

April 10.—Pleural friction audible all over the area, and here and there for about 2 inches all round it.

April 16.—Respiration easier. Patient said that he felt his back to be straighter. Appetite normal again.

April 28.—All the crepitations at the apices disappeared. Patient returned to work again.

May 4.—Pleural friction very marked in the whole area of dulness in the left side.

August 1.—In consequence of my own illness (rheumatic fever and erythema) I did not again examine patient until this date. During my inability to work, however, the treatment was applied daily by Dr. Harry Kellgren and others. The area of

former complete dulness was now only partially dull on percussion, and was also smaller in extent, measuring about 2 inches by 3 inches. Pleural friction was audible over it, and in a few small isolated patches round it.

September 27.—Treatment finished. Owing to my temporary absence I did not examine patient until October 5. On that date he still suffered some pain in the left side, but it was never sharp and stabbing as it used to be. The spinal column was straighter. The point of greatest convexity was distant 4 c. from a line drawn between the spines of the first dorsal and first lumbar vertebræ. On attempting to straighten the

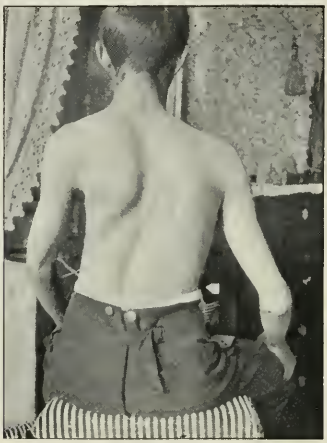

Fig. 108.

spine this distance could be reduced to 3 c. The left side was much less sunken in (see fig. 108). There was no dulness on percussion; pleural friction was audible over the area of former dullness and in the fifth and sixth interspaces for about 2 inches in their length outside the apex beat. The respiration was 19 per minute.

The apex beat could be seen and felt in the fourth and fifth interspaces, about half an inch internal to the nipple line.

The pulse on standing up was 72 per minute. Appetite was good. General condition was stronger.

Although this case was by no means cured, it shows what could be effected even when the abnormal condition had lasted for more than five years before coming under the influence of the manual treatment.

It may not be out of place here to make some remarks on the treatment of spinal curvatures by means of combining gymnastic methods with mechanical support from a corset, &c. I heartily agree with the doctrine of the Ling school,[1] which has always been that such mechanical appliances, by giving support to the weakened muscles and thereby partially rendering their co-operation unnecessary, do more harm than good. The principle of their action is, in fact, directly opposed to the principle of gymnastic treatment, the object of the latter being invariably to strengthen the weakened muscles at the expense of their antagonists.

Wide,[2] however, recommends the use of such mechanical appliances.

[1] *See*, for example, Hartelius, "Lärobok i Sjukgymnastik," 1883, pp. 326, 327; 1892, pp. 314, 315; and "Skolios och dess Behandling med Sjukgymnastik," in *Tidskrift i Gymnastik*, 1881, part 15, pp. 913, 914.

[2] "Handbok i Medicinsk Gymnastik," 1896, pp. 429, &c.; "Handbook of Medical Gymnastics," 1899, pp. 358, &c.; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, pp. 363, &c.; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 357.

CHAPTER V.

DISEASES OF THE DIGESTIVE ORGANS.

Acute Membranous Tonsillitis.

K. I., male, aged 45, already under treatment for lateral sclerosis, came to my house for his usual daily treatment on October 16, 1899. During the evening of the same day patient felt feverish and had some difficulty in swallowing.

October 17.—Aggravation of these symptoms; during the course of the afternoon, delirium, lasting for about an hour, supervened at 4 p.m. I saw patient at 7 p.m.

Examination.—Patient fairly clear in his head; difficulty in swallowing; both tonsils enlarged and swollen, and patches of yellowish membrane on them; uvula also swollen, but no membrane on either it or the pillars of the fauces. Fever and accelerated pulse rate; after treatment, temperature 104°, pulse 130.

October 18.—Treatment twice. During morning, temperature 102·6°, pulse 125; after treatment, 102° and 115 respectively. During the evening, temperature and pulse 100·2° and 108, and 99·6° and 106 respectively before and after treatment.

October 19.—Morning. Swallowing easier. Temperature 100·4°, pulse 112. Treatment, after which temperature 99·8°, pulse 102.

Evening. Temperature 99·2°, pulse 98. Treatment, after which temperature 98·6°, pulse 96.

October 20.—Patient got up and walked about. Swallowing much easier; no membrane left, only some redness. Treatment once during the evening. Temperature 97·8°, pulse 65.

October 21.—No redness. Temperature 98·6°, pulse 70. Treatment once.

October 22.—Patient went out for a walk.

October 23.—Treatment stopped as regards the throat affection, the throat being normal.

December 10.—Throat had remained quite well since I had last seen it.

Treatment.

Vibrations on the larynx, pharynx and sublingual regions; frictions on the nerves of these parts. General treatment for fever.

Acute Catarrhal Appendicitis.

To Henrik Kellgren belongs the credit of having been the first to introduce gymnastic methods into the treatment of acute appendicitis. A. Levin of the G. C. I. made efforts in this direction, the incentive being, as he himself says, what he saw while studying under Henrik Kellgren during 1887; his results were published in 1892[1]. Hartelius does not mention appendicitis in his handbook.[2] Wide, of course, strongly condemns all attempts at gymnastic methods for appendicitis.[3]

The objects of Kellgren's treatment as applied to acute appendicitis are as follows :—

(1) To diminish the inflammatory process in the appendix, and thereby prevent the formation of abscess; and to diminish the tendency to the formation of adhesions, exudation, &c., round about the local lesion, or if such have formed, to remove them.

(2) To diminish the tension in the abdomen, and thereby cause the blood and lymph flow to proceed better; and to prevent stasis, which so powerfully predisposes to lowered vitality of the part.

(3) To improve the constitution generally.

These objects are gained by means of the following manipulations :—

(*a*) Vibrations over the appendix and over any inflamed or painful area in the right iliac fossa.

(*b*) Gentle stomach exercise administered at first only on the left half of the abdomen; making the patient practise deep respira-

[1] "Om Massage vid Blindtarmsinflammation," in *Tidskrift i Gymnastik*, 1892, pp. 684, &c.

[2] "Larobok i Sjukgymnastik," 1870, 1883, 1892.

[3] "Handbok i Medicinsk Gymnastik," 1896, p. 226; "Handbook of Medical Gymnastics," 1899, p. 209; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 201; "Handbook of Medical and Orthopædic Gymnastics," 1903, p. 214.

tions, side shaking, vibrations or frictions on the lower intercostal nerves (thereby also affecting the splanchnics), &c.

(*c*) General treatment for fever.

Case 1.

Mr. K., aged 43, came under the manual treatment on August 18, 1898.

Previous history.—Quite good.

History of present illness.—Patient was seized on August 17, 1898, throughout the abdomen generally with sudden pains, which did not seem to arise from any particular spot; he could assign no cause for their coming on. In a quarter of an hour or so he felt very bad and went to bed. Fever set in some two or three hours later, and patient was then able to locate the pains in his right iliac fossa. He felt very weak and ill, and during the evening of the same day sent for his medical man. The latter diagnosed appendicitis, and, while making his examination, he palpated the right iliac region, which caused the patient very much pain. An ice-bag was placed on the right iliac region, an enema given, and opium prescribed. There had been no motion since the morning of August 16; the enema did not call forth one.

Patient slept very badly; the pains in the abdomen increased, and nausea set in, although no actual vomiting occurred. No motion took place, and the appetite disappeared. On August 18 the medical man said that if the temperature rose any more he must operate. Patient did not like the idea of an operation, and thought he would instead try the manual treatment. I was called in during the evening of August 18.

Examination.—Patient in bed, with sunken eyes, looking very weak. He preferred lying on his back with his legs drawn up. He complained of continued severe pain in the right iliac region, and a sense of weight and oppression in the abdomen generally; also of headache and general weakness. A sense of nausea was present, but no actual vomiting had occurred; sometimes eructations and also passage of flatus per rectum took place. Patient had eaten nothing all day, but had drunk some water at intervals. No motion had taken place since the morning of the 16th.

The abdomen looked distended; it was very resistant on palpation, especially in the region of the right iliac fossa, where

even slight pressure caused a good deal of acute pain, the pain being most marked at McBurney's point. There was reflex contraction of the abdominal muscles over the right half of the abdomen, and the abdomen did not move with respiration. The urine was dark and scanty. No rigors had occurred. No rectal examination was made. Temperature 102·4°; pulse 115, weak.

Treatment.

Vibrations over the painful part, especially the point of greatest pain, which, however, often changed its place, the point of application of the vibrations being changed accordingly. In the course of a few minutes the pain diminished, and the patient could stretch out his legs without extra pain. After a few more minutes the contraction in the abdominal muscles grew less, and the vibrations could be administered with greater vigour. In addition, gentle stomach exercise, side shaking, &c., head vibration, and the ordinary treatment for fever.

After the treatment patient looked and felt better. The headache had been perceptibly lessened. The abdomen was less distended, this being partially due to the patient having vented much gas from his stomach and passed a good deal of flatus per rectum; but no motion had resulted. There was less contraction in the abdominal muscles, especially over the right iliac fossa, and much less pain in that region, where a circumscribed tumour could be made out, although the boundaries could not be well defined on account of the tenderness. Temperature 100·2°; pulse 93.

Patient remained fairly comfortable until about two hours after the treatment, when the pain in the right iliac fossa set in again. He slept fairly well.

August 19.—9 a.m. No motion yet. Patient had suffered a good deal of pain in the right iliac fossa; it was, however, not so bad as when I first saw him, and he had been able to lie with his legs straight all night. The tumour was considerably smaller than during the previous evening. Temperature 100°; pulse 100. Treatment as before.

3 p.m. Temperature 102°; pulse 100. Treatment.

9 p.m. The tumour has been reduced to a small round mass. The urine was clearer, the quantity greater than during the

previous day. Temperature 101·9°; pulse 106. Patient had consumed nothing during the day except a little milk. Treatment.

Patient was treated three times during the course of this day, and each time the treatment almost entirely removed the pain in the right iliac fossa, it being then only perceptible on considerable pressure.

August 20.—Patient slept very well. During the early morning he passed a copious, evil-smelling black motion.

10 a.m. Not much pain in the right iliac fossa. Temperature 99·8°, pulse 103. Treatment as before; after it no pain on deep pressure in the right iliac fossa, only some tenderness. Sense of resistance was still present, but no tumour could be felt. After treatment patient got up and sat up in a chair; he ate some bread and butter and drank some milk during the course of the day.

Evening. Temperature 101·5°, pulse 108. Slight return of the pain, which, however, disappeared after the treatment. The urine was still clearer. Another motion during the evening.

August 21.—Patient up all day. Appetite returning; one motion. No sense of resistance in the right iliac region. Temperature 99°, pulse 90. Treatment once during the evening.

August 22.—Patient feeling normal, except for weakness; he walked from his house to Sanna (distance three-quarters of a mile), and in addition to vibrations, &c., over the abdomen, and stomach exercise, performed some active exercises. No tenderness any more in the abdomen. Urine normal. One motion during the course of the day.

August 23.—Patient had eaten during the previous day as usual, meat, vegetables, milk, &c. He did not, however, feel equal to walking to Sanna, and so was treated at home. Temperature 98°, pulse 85.

August 24.—Patient drove to Sanna, where he was treated.

August 25 to September 5.—Patient walked to Sanna and back daily. He received special treatment for the abdomen and a few active strengthening movements. Motion daily since August 22.

September 5.—Treatment finished. Patient normal.

Patient, who had enjoyed excellent health ever since his illness, emigrated to America in February, 1901; I have not heard of him since.

Case 2.

J. A. S., aged 35, male, came under the manual treatment on July 23, 1902.

Previous history.—Patient had always been well and strong.

History of present illness.—On getting up at 6 a.m. on July 22 he felt ill, but went to work as usual. The feeling of illness increased, and he was obliged to go home; at about 9 a.m. he was seized with pains in the arms and abdomen, and had to go to bed. He vomited watery stuff all the morning, and perspired very much. Towards afternoon the abdominal pain became more severe; he was unable to assign its origin to any particular spot. At about 4.30 p.m. he had rigors, which lasted until 6 p.m., and the pain in the abdomen, which he could now locate in the right iliac fossa, became so severe that he screamed continually. He lay on his back with his legs drawn up, occasionally, however, rolling about in bed for sheer pain. At about 7 p.m. he was relieved somewhat by a motion which looked normal, although it smelt worse than usual. He did not sleep at all because of the pain, and at about 4 a.m. the following morning (July 23) had another rigor, this time of an hour's duration. At 10 a.m. I was sent for.

Examination.—Patient was lying on his back, with flushed face; there was no abdominal look. He preferred lying with his legs drawn up, especially the right one, but was able to lie with them straightened. He complained of severe pain in the region of the right iliac fossa, and also to a less extent in the whole right half of the abdomen. There was contraction of the abdominal muscles of the right half of the abdomen; tenderness on palpation, and great tenderness to pressure in the right iliac fossa; cutaneous hyperæsthesia at McBurney's point. The whole right half of the abdomen was filled up by a large tender mass which was fairly hard, especially in the right iliac fossa. The left side of the abdomen was normal. The spleen and sixth to twelfth dorsal nerves of the right side were tender to friction. The urine was darker than normal. Temperature 101·3° (all the temperatures were taken *per rectum*), pulse 102, thready.

After treatment there was no pain and very little tenderness, although the contraction of the abdominal muscles was only slightly improved. Patient looked better and said that he felt better. He drank some soup. Treatment twice a day henceforth.

Evening. The pain and tenderness had returned to some extent, and the abdominal muscles were more firmly contracted. Temperature 101·3°, pulse 90. No pain after treatment, and very little tenderness. Patient drank some more soup and went to sleep.

July 24.—Morning. Patient had slept fairly well; and eaten an egg for breakfast. Right iliac fossa very tender. Temperature 101·8°, pulse 76. Urine normal.

Evening. Patient had at intervals been sitting up in bed, and had left it altogether while it was being remade. He ate an egg and some bread and butter during the evening. No motion. Temperature 100·6°, pulse 72. After treatment no pain and not much tenderness.

July 25.—Patient slept well, and ate an egg and bread and butter, and drank some milk for breakfast.

Morning. No pain at all; tenderness in abdomen about the same as during the previous evening. Temperature 99·9°, pulse 65.

Patient got up for a few minutes during the course of the day. He ate pancakes with cranberries and milk for dinner. Later, after fifteen minutes effort, he passed a motion consisting of a few very hard lumps.

Evening. At supper, patient took the same food as at breakfast. Temperature 101.1°, pulse 72.

July 26.—Patient slept well; he ate during the day about the same as during the previous day. No motion took place.

Morning. Temperature 101·1°, pulse 68. During the course of the day there was some return of the pain, and the tenderness was more marked.

Evening. Condition improved. Temperature 101·5°, pulse 72.

July 27.—For breakfast patient ate an egg, some cold meat and some bread and butter, and drank some milk.

Morning. Patient much better. Only slight tenderness left in right iliac fossa, none in the rest of the right side of the abdomen. The large mass in the right iliac fossa much smaller, only about the size of a billiard ball. Hardly any contraction of the abdominal muscles. Temperature 99·9° pulse 54.

Evening. Patient had a motion during the afternoon which was rather hard, though otherwise normal, and was up for an hour. He had milk and bread and butter both for dinner and supper. Temperature 99°, pulse 60.

July 28.—Treatment only once a day henceforth, during the morning.

Morning. Patient much better; the mass in the right iliac fossa rapidly disappearing. Temperature 98·1°, pulse 54. Diet: breakfast, egg, milk and bread and butter; dinner, meat, potatoes and milk; supper, porridge and milk. Patient was up all the afternoon. No motion.

July 29.—Morning. Temperature 97·9°, pulse 56. Patient up all day. Motion.

July 30.—Slight tenderness in the right iliac fossa, otherwise nothing abnormal in the abdomen. Patient went out for a walk; he would have done so the previous day had it not rained without ceasing. No motion.

July 31.—Patient stronger. Motion.

August 1.—Patient walked to my villa and back for treatment (distance nearly one mile each way).

August 3.—No treatment.

August 9.—Motion daily since August 1. Treatment finished. There had been no tenderness in the abdomen since the 5th, but patient had continued treatment in order to regain his strength.

August 11.—Patient returned to the factory, working as usual for nine and a half hours a day.

September 18, 1902.—Patient had been quite well ever since his illness.

The treatment was practically the same as for the last case.

Acute Rapidly Extending Peritonitis.

Mrs. S., aged 39, came under the manual treatment on February 25, 1902.

Previous history.—Patient had suffered from chronic constipation for the last twelve or fifteen years. She had had nine children. On February 8 she was delivered of her ninth child, the labour being normal in every respect.

History of present illness.—On February 24 she went out for the first time since her confinement in order to go to the closet, which was in an outhouse (as is usual in the country in Sweden). She had not had a proper motion since her confinement; this time, as usual, she had to wait some minutes before the motion came. It was very cold (— 8° C.) and windy, and she felt that she

got a chill. During the evening of the same day she had a rigor lasting about five minutes, followed by attacks of sharp stabbing pains in the whole of the abdomen; these recurred at ever shorter intervals. The midwife who attended her last confinement was called in, and administered an enema which resulted in a motion. During the night patient was feverish, felt very ill and had continued attacks of violent pain in the abdomen, which were so bad as to cause her to cry out. Slight relief was obtained by keeping her legs drawn up. The attacks lasted from ten to fifteen minutes, and the pauses between them lasted from two to three minutes only. She was quite unable to move without bringing on the attacks. On one occasion she vomited.

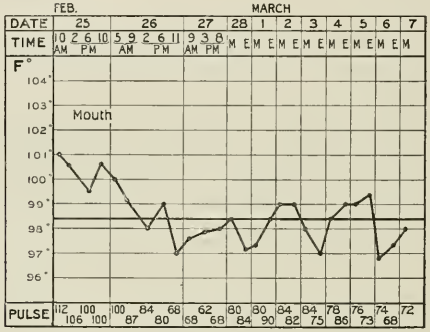

Fig. 109.

Examination.—February 25. Morning, 9 a.m. Patient lying on her back with her legs drawn up, abdominal facies very marked. Complained of attacks of pain in the abdomen, chiefly the lower part, the pain being so intense as to cause her to cry out, and being aggravated by the slightest movement. Reflex contraction of abdominal muscles present, especially in the hypogastric region. Respiration accelerated and purely thoracic, abdominal breathing impossible. Patient could hardly bear the slightest touch on her abdomen. Great tenderness over sixth to eleventh dorsal nerves near the spine. Vaginal discharge increased in amount, no bad odour. Micturition caused a burning sensation and much pain. Thready pulse. (For temperature and pulse see separate chart, fig. 109.)

I first executed very fine vibrations over the hypogastric region, gradually increasing their strength, and maintained these for three-quarters of an hour. During that time patient suffered only three attacks of pain, which were less severe than those occurring during the night and only lasted from two to five seconds, and the abdomen became less tender. I then executed vibrations over the abdomen as a whole and frictions on the ovaries and the dorsal and lumbar spinal nerves. I tried to get patient to breathe abdominally, but the attempt was attended with too great pain; some eructation followed.

11.30 a.m. Pains less severe than during the night, but now experienced all over the abdomen. Tenderness in entire abdomen, especially in epigastrium. A good deal of eructations.

2 p.m. Patient had vomited twice since 11.30. Large amount of eructations. After treatment abdomen softer, and able to bear more pressure than before; patient able to move in bed without pain; abdominal respiration fairly easy and attended by little pain.

5 p.m. Patient had vomited once since last treatment. Pain less, chiefly in epigastrium. Fever less. Treatment, after which patient slept for three hours.

11 p.m. There had been no vomiting since the afternoon. Patient better. Treatment.

February 26.—5 a.m. Rather severe pain from 2 to 4 a.m.; since then less severe Treatment.

9 a.m. Treatment repeated.

2 p.m. Abdomen moved unconsciously during respiration; deep abdominal respiration only caused uneasiness. Pain much less severe. Fairly strong pressure could be applied to the abdomen, and a gentle stomach exercise was administered; gurgling sounds from the intestines could be heard meanwhile. Patient passed flatus several times during the morning.

8 p.m. Patient had slept ever since I treated her last. Patient drank some soup during the afternoon. Treatment.

11 p.m. Not much pain; vomiting entirely ceased since the previous day. Treatment.

February 27.—9 a.m. Patient had been sitting up in bed for two hours before my arrival, with hardly any pain. After treatment she got up and sat on the sofa while the bed was being made. Very little pain.

3 p.m. Treatment.

8 p.m. Patient had been drinking milk and soup. I administered, among other manipulations, an ordinary stomach exercise. Hardly any pain.

Patient treated twice a day henceforth.

February 28.—9 a.m. Patient had passed two motions during the night; they were black and smelt very badly. After the first she had had some pain, but after the second none. She had eaten some bread and butter and drunk some milk. She began this morning to give her baby milk from the breast for the first time since her illness (I did not know of this until several days afterwards), and during the afternoon she sat on the sofa for two hours.

7 p.m. One tender spot in the right iliac fossa. A medium vibration executed on it for a few seconds caused a loud gurgling sound, followed by immediate cessation of the tenderness.

March 1.—One motion. The tender spot in the right iliac fossa had returned, and there was still some tenderness over the lower dorsal nerves; distinct improvement in both after treatment. Patient up during most of the day.

March 2.—A motion during the night; for a while after it some pain, which then ceased permanently. The tenderness in the right iliac fossa had disappeared. Patient ate meat, eggs, milk, &c., and was up all day.

March 3.—One motion. Patient ate her ordinary food and was up all day. During the evening she said that beyond a feeling of looseness and tiredness in the abdomen, and some weakness in general, she felt quite normal.

March 5 to 10.—Motion daily. Active exercises prescribed, amongst others, sitting trunk extension and flexion, PA. On March 10 patient went out for a few minutes; the temperature was — 7° C.

March 13.—Some weakness still left. Patient was fulfilling her household duties as usual. Treatment once a day henceforth.

March 22.—Motion daily; patient normal. Treatment finished.

July 12, 1902.—Patient had had a motion daily since above date. She said that she felt stronger than before her illness, that her digestion had also been better, *e.g.*, she had been able to eat freely of fatty articles of diet, which before her illness she had never been able to do.

August, 1903.—Still keeping quite well.

Acute Gastro-Intestinal Catarrh.

Hartelius[1] states that acute gastric catarrh, when severe and combined with fever, is not amenable to gymnastic treatment.

Miss L., aged 13, came under the manual treatment on December 19, 1900.

Previous history.—Good.

History of present illness.—Patient was taken ill on December 17, 1900; the onset was sudden, and accompanied by a rigor, fever, and severe headache. About an hour afterwards patient vomited some green matter, repeating this at intervals. Greenish diarrhœa appeared during the course of the day, the colour changing to brown after a few motions. Patient slept very badly, vomited every half hour, and was delirious. December 18.—Patient vomited about once an hour during the day, the vomit being still greenish in colour, and she suffered from continued diarrhœa and high fever. She was again delirious during the night.

On the morning of December 19 I was sent for.

Examination.—Patient had been vomiting green matter all night at intervals of about an hour, and had had two diarrhœic motions to-day. She had been delirious all night, and was so when I saw her; on being asked questions she invariably replied: "I have a very bad headache." She had eaten nothing since December 17, and had only drunk water, which was invariably vomited after a few minutes. Temperature 104°; pulse 138. The breathing was thoracic and laboured, the abdomen painful and tender, and in it continued gurgling sounds were audible, which were greatly increased on slight pressure. The heart and lungs showed nothing abnormal.

The vomit had been thrown away, and I was therefore unable to see a specimen.

Treatment.—Head exercise, abdomen vibrations; after a few minutes I could administer a gentle stomach exercise. I also executed spinal nerve, kidney and spleen frictions, &c. After treatment patient became clear in her head, and was able to sit up. The abdominal pain was diminished, the headache alleviated, and the general appearance improved.

[1] "Om Sjukgymnastiken vid Gymnastiska Central Institutet under år 1863," 1864, p. 48.

6 p.m. same day. There had been no diarrhœa or vomiting since my last visit. Tenderness in abdomen almost gone; very little headache. Temperature 99·2°, pulse 102. Treatment as before.

December 20.—Patient had slept very well, and appetite was returning. No vomiting since the previous evening; one soft motion. Temperature and pulse normal. Patient got up and sat in a chair during the greater part of the day. Treatment once.

December 21.—Beyond a general feeling of weakness, patient felt quite well. Treatment for the last time.

August 2, 1902.—No return of the symptoms.

Acute Intestinal Catarrh.[1]

Mrs. S., wife of my coachman, aged 28, came under the manual treatment on August 20, 1900.

Previous history.—Patient had had incipient phthisis seven years previously, which was cured by the manual treatment. Since then she had been fairly strong.

History of present illness.—On August 19, 1900, patient was employed during the greater part of the day in washing clothes, and getting tired she laid down in the damp grass to rest. During the evening she walked to a neighbouring town three miles off. She slept fairly well until 8.30 a.m., when she was conscious of severe headache, shivering attacks, and pain in the abdomen; profuse and frequent diarrhœa came on, greenish in colour. I was sent for at 11 a.m.

Examination.—Patient did not recognise me, and when I asked her questions, kept on saying that she had a headache. She perspired freely, and her head felt very hot. Temperature not taken as I had no thermometer with me; pulse 140. Abdomen painful and gurgling and tender to touch.

Treatment.—Vibrations over the abdomen; head exercise, spinal nerve frictions, kidney and spleen frictions. In conse-

[1] *See* Wide, "Handbook of Medical and Orthopædic Gymnastics," 1903, pp. 209, 210: "Intestinal catarrh, both acute and chronic is treated by Swedish gymnasts with abdominal movements. In acute intestinal catarrh this treatment should be advised against by everyone who knows that rest for the whole constitution and intestines, produced by suitable means, is effective within a few hours." *See also* "Handbok i Medicinsk Gymnastik," 1896, p. 219; "Handbook of Medical Gymnastics," 1899, p. 204; "Handbok i Medicinsk och Ortopedisk Gymnastik," 1902, p. 204.

quence the abdomen became less tender, and patient recognised me again. Pulse 110 after treatment.

4 p.m. Temperature 104°, pulse 108. Patient again wandering in her mind. Diarrhœa now greenish yellow, and more frequent, often five or six times per hour. After treatment, patient recognised me and said that she felt better, and then went to sleep. Pulse 100. Gentle stomach exercise added to treatment.

9 p.m. Temperature 101·3°, pulse 100. Diarrhœa not quite so frequent, three or four times an hour between 4 and 6 p.m., then only about twice an hour. Treatment; temperature 100·8° and pulse 85 after it was over.

August 21.—Patient slept badly. About six greenish-brown diarrhœic motions during the night.

11 a.m. No headache, but patient very tired. Temperature 97·7°, pulse 74. Treatment.

Evening, 8 p.m. Patient had had no diarrhœa from 9 a.m. till 12 noon; then five or six times between 12 and 3. Then no more; and after 3 o'clock she had been able to sit up and read the newspaper. Temperature 98·6°, pulse 65. Treatment. After it was over, patient ate some bread and butter and drank some milk for supper.

August 22.—Patient slept well, and ate her usual breakfast during the morning. She said that she felt quite well though weak. No motion since 3 p.m. the previous day. Treatment once with a few active exercises, general nerve treatment, stomach exercise, &c.

August 23.—Two normal motions during the day. Treatment once during the morning. Appetite normal. Patient said that she felt quite well and strong. Treatment finished.

October, 1902.—Patient had been quite well ever since her illness, and went through a normal confinement (her third) in September, 1901.

August, 1903.—Still keeping quite well.

Chronic Appendicitis.

Mr. W., aged 22, came under the manual treatment on August 27, 1900, on the advice of Dr. Engstrand (the head medical man in Jönköping).

History of present illness.—Early in 1899 he had his first attack of appendicitis. His medical man prescribed morphia, rest

in bed and strict dietary precautions. The patient got over the attack rather quickly, remaining in bed only eight days; but on first getting up again felt very weak. He never felt really well, and had a relapse in July of the same year, the second attack being about as bad as the first. He had another relapse in November, and a third in the middle of December. Each of these attacks lasted about eight days, the treatment adopted being invariably the same. On December 26 he tried massage and medical gymnastics (Ling's system) for a month; but he had three further relapses during that time, and then decided to stop the gymnastic treatment, as he thought it was doing him harm. Ever since 1899 he had never been free from pain in the right iliac fossa, the pain being worse just after every meal; and he suffered chronically from constipation. He had become markedly thinner since the first attack. He remained in much the same low condition until August 10, 1900, when he had another relapse, which, however, was not so bad as usual; on this occasion he was only four days in bed. On August 26, Dr. Engstrand recommended the patient to try the manual treatment.

Examination.—Patient was thin, pale and feeble looking. He complained of continual pain in the right iliac fossa, most severe just after meals. His appetite was bad, and he suffered from constipation, a motion coming on an average only every third day. There was considerable tenderness in the right iliac fossa, and pressure there caused pain. The thickened vermiform appendix, about an inch in diameter, could be plainly felt. Patient slept badly, and was somewhat depressed.

Treatment.

(1) Half lying appendix region vibration, &c., PP.

(2) Side span standing drawing forwards, PP, kidney frictions, PP.

(3) Side lying leg lifting, AR, pressing down, PR.

(4) Sitting trunk extension and flexion, PA.

(5) Stretch stride standing bending forwards, PA.

(6) Forwards lying back exercise, PP.

(7) Stretch span standing drawing forwards, PP, abdominal intercostal nerve frictions, PP.

(8) Heave grasp standing chest expansion, PA.

(9) Ride sitting alternate rotation, AR, ringing, PP.

(10) Half lying stomach exercise, PP.

Progress.—August 30.—Less pain in the right iliac fossa.

September 7.—Patient had been alternately worse and better during the last eight days; on this day, however, he felt considerably better. There had been a motion every day since September 1.

September 10.—Hardly any pain in the right iliac fossa. Patient said that he felt stronger.

September 26.—Patient was obliged to stop the treatment to-day. His general condition was considerably improved; he felt stronger and slept better; also his appetite was better. A motion took place every day. There was no tenderness over the right iliac fossa, and the thickened vermiform appendix had quite disappeared; that region of the abdomen was apparently quite normal.

October 13.—In reply to a letter of mine, patient wrote, "I find myself in very good health, and the pains in my abdomen with which I was specially troubled are now quite insignificant. The last few days I have been troubled with diarrhœa from which I have quite recovered. On the whole I feel very well and strong."

Constipation.

The objects of the manual treatment as applied to constipation are as follows:—

(1) To improve the laxness of the anterior abdominal muscles; the latter are nearly always found to be weak and thus easily allow dilatation of any portions of the intestine. By improving the strength of these muscles such dilated portions of the intestine are reduced in size, and the circulation through the abdomen is promoted.

Increase of strength in the anterior abdominal muscles in all probability also acts reflexly in a stimulatory way on the abdominal contents.

(2) To improve the circulation in the abdomen and bring more arterial blood to the weakened intestine.

(3) To stimulate the intestinal muscle to contraction; this will in its turn promote the venous flow, promote absorption by the lymphatics, cause the intestinal contents to pass on more

quickly, and improve the flow of intestinal juice. All this reacts in its turn in a stimulatory way on the intestine.

Case 1.

(From notes taken by Dr. A. Möller and myself.)

Miss P., aged 35, came under the manual treatment on November 15, 1899.

History of present illness.—Patient has been suffering from chronic constipation since 1881, occasionally getting better for a few months, and then becoming worse again. Patient informed me that she had been taking pills fairly constantly during the last eleven years, and had had perpetually to resort to enemas, &c. She had had no motion for several days, and of late eight days had often elapsed without one taking place. She likewise complained of severe headache and was nervous and depressed.

The treatment was as follows :—

(1) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(2) Stretch grasp standing drawing forwards, PP, abdominal intercostal nerve frictions, PP.

(3) Stretch stride standing bending forwards, PA.

(4) Sitting trunk extension and flexion, PA.

(5) Forwards lying back exercise, PP.

(6) Sitting head exercise, PP.

(7) Loin lean stride standing alternate rotation, AR, ringing, PP.

(8) Stretch half lying running nerve frictions, PP, side shaking, PP.

(9) Half lying leg rolling, PP, flexion, PA, extension, AR.

(10) Half lying stomach exercise, including frictions on the ganglion impar, PP.

Patient was ordered to stop all medicine, enemata, &c.

Progress.—November 17.—Headache disappeared, and did not return during the month patient remained under treatment.

November 20.—Normal motion.

November 22.—Motion. After that patient had a motion almost every day until November 28. Then none until November 30, during menstruation. After that daily until December 15. Treatment then stopped, patient feeling very well.

She remained so until the middle of January 1901, when she gradually became constipated again; her headaches returned also.

She came back to me on May 14, 1900, with recurrence of the headache and constipation; she had not had a motion for five days. The treatment was resumed, the gymnastic prescription being practically the same as before. After the first day of treatment, her headache disappeared and did not return; she had a motion on the same day and also on May 16. She continued the treatment until June 20, and had a motion daily from May 16 until then with only two exceptions, on May 24 and June 5.

September, 1900.—I heard that patient was keeping quite well and had a motion daily.

In this case I made the observation that frictions on the ganglion impar produced at first no sensation; as improvement took place, this sensation returned, and after about three weeks a kind of lightning feeling began to be felt throughout the abdomen when the frictions were executed.

Case 2.

G. A., aged 9, had been constipated almost since birth. Temporary improvement took place when he underwent the treatment for facial paralysis two years previously, due no doubt to the exercises for improving the condition of the body in general; but after it was over he relapsed again into his former condition. Often three days would pass without an evacuation, upon which his mother would administer an enema, which would produce the desired effect. He did not suffer from any special symptoms in consequence of this, although he was thin, small, and rather undersized for his age. The treatment was administered daily from June 23 to July 31, 1900; the constipation entirely disappeared, a rectal evacuation taking place daily during the last fortnight of the period specified. In September, 1902, patient's bowels were still acting regularly.

The treatment was on the lines already indicated.

Chronic Intestinal Catarrh.

A. E., aged 45, male, came under the manual treatment on July 29, 1902.

History of present illness.—Patient's motions had for some years every now and then been loose, although he could not say that he actually suffered from diarrhœa. During the summer of 1901, however, the looseness developed into diarrhœa, and during the month of August he passed daily some two or three diarrhœic motions. He was unable to ascribe any cause for this change. The condition got steadily worse; and from January, 1902, onwards he would have as many as four or five motions between 5 a.m. and 9 a.m., and as many more during the rest of the day. In January the motions were still brownish in colour, but then gradually paled to yellowish-brown, becoming also more watery. During March they became the colour of pea soup, and from June onwards were even of a lighter yellow. Patient had steadily become weaker and thinner during the last four or five months.

Examination.—Patient had no pain in the abdomen, and his clothes did not irritate the skin of this region. He noticed very much gurgling in his abdomen, especially during the morning. He had had a dry cough for some years past, especially during spring and autumn, and the attack of coughing often terminated with a vomit; he did not vomit otherwise. His appetite had remained good.

The motions were now very watery indeed, and light yellow in colour, with an unpleasant odour. Patient had never noticed any blood in them. Some tenderness was manifested on administering stomach exercise, and loud gurgling sounds were heard meanwhile. The liver, however, was very insensitive to pressure below the costal margin, and to frictions on the gall-bladder; and there was less sensation while receiving frictions on the sixth and seventh dorsal nerves on the right side posteriorly near the spinal column than while receiving them on the rest of the spinal nerves, which on the whole were rather more than usually sensitive, especially the ninth to twelfth dorsal nerves.

Patient had been steadily losing weight during the last few months, and had felt continually tired and weak. His weight was 54 kilos. at the time of examination.

Treatment.

(1) Stretch grasp standing drawing forwards, PP, liver and gall bladder frictions, and frictions on the right sixth and seventh dorsal nerves near the spine, PP.

(2) Half lying double arm rolling, PP, bending and stretching, AR.

(3) Loin lean stride standing alternate rotation, AR, ringing, PP.

(4) Stretch side lying running nerve frictions, PP, liver and right sixth and seventh dorsal nerve frictions, PP.

(5) Lying double leg flexion and extension, PA.

(6) Hip lean walk standing lateral flexion, PR, extension, AR.

(7) Heave grasp standing chest clapping, PP, side shaking, PP.

(8) Half lying abdomen vibration, PP.

(9) Half lying stomach exercise, frictions on the abdominal sympathetic, PP.

Progress.—Patient's condition steadily improved.

August 13.—Only two loose motions between 5 a.m. and 9 a.m; two more during the course of the day. They were browner in colour.

August 28.—The motions had diminished to two loose ones before breakfast and none during the rest of the day; they were of normal colour. Patient's weight 55 kilos.

September 30.—The daily number of motions continued to be no more than two, which were of normal colour and consistence. Patient's weight 59¼ kilos. Patient felt quite well and strong. Sensation along the liver and in the corresponding spinal nerves was normal. Treatment finished.

Diarrhœa.

L. J. T., solicitor, aged 29, came under the manual treatment on February 6, 1903.

History of present illness.—On February 2 patient felt very tired all day; during the morning he vomited his breakfast, and diarrhœa commenced, compelling him to evacuate every hour. Patient felt that the motions were watery, but did not notice their colour. He ate nothing all day, but was still able to attend to business. February 3.—Patient remained in bed all day; he felt very weak, and had a continued feeling of diarrhœa; light coloured watery motions occurred every hour or so during the day and every third hour during the night. There was no vomiting. Patient ate practically nothing, and took chalk mixture three times during the day.

February 4.—Patient was a little better; he had a continued feeling of diarrhœa, but managed to control it so that there were only three motions during the course of the day. His appetite was slightly better, and he ate a little boiled cod for lunch; chalk mixture t.i.d. February 5.—Condition the same; diet the same as during the previous day. Patient felt so weak that he took some brandy during the evening. Chalk mixture t.i.d. February 6.—Condition unchanged. I was called in at 6 p.m.

Treatment.—Vibrations over the abdomen, gentle stomach exercise, spinal nerve frictions. Patient's appetite returned after treatment; he ate some beef and drank a bottle of beer. Normal motion during the evening.

February 7.—Patient felt quite well again, appetite normal; diet as usual. No motion at all during the day. Treatment for the last time.

February 8.—Normal motion during afternoon.

May 28, 1903.—I saw patient again; he had been quite well ever since his attack.

CHAPTER VI.

HEART DISEASES.

Heart diseases were treated by P. H. Ling,[1] Branting,[2] Georgii,[3] Rothstein,[4] Neumann,[5] Richter,[6] Eulenburg,[7] Melicher,[8] Hj. Ling,[9] Hartelius,[10] and others.[11]

The objects of the manual treatment as applied to heart disease are as follows:—

I.—To enable the heart to act better by promoting the circulation and stimulating the heart directly.

[1] "Gymnastikens Allmänna Grunder," (1834) 1840, pp. 172, &c. *See also* Massmann, "P. H. Ling's Schriften über Leibesübungen," 1847, pp. 75, 76.

[2] "Efterlemnade Skrifter," 1882, gymnastic prescriptions for 1840, *et seq.*; "Årsrapport till Kongl. Sundhets-Kollegium år 1861," 1863, pp. 34, &c. *See also* Roth, "Handbook of the Movement Cure," 1856, pp. 276, 367.

[3] "Kinésithérapie," 1847, p. 50; "Kinetic Jottings," 1880, pp. 168-173, 197-199, &c.

[4] "Die Gymnastik nach dem Systeme des Schwedischen Gymnasiarchen P. H. Ling," 1847, pp. 93, 102-105; "Nachrichten über das Schwedische Centralinstitut für die Gymnastik," in *Athenæum für Rationelle Gymnastik*, vol. iii., 1856, pt. 2, p. 141.

[5] "Therapie der Chronischen Krankheiten," 1857, pp. 314-316; "Lehrbruch der Leibesübungen," 1856, pt. 2, pp. 302, &c.; "Bericht über das erste Jahr," &c., in *Athen. f. Rat. Gym.*, vol. i., 1854, pt. 1, p. 263; "Die Einführuug der Heilgymnastik in Lazareth und Klinik," *ibid.*, vol. ii., pt. 1, p. 1; "Bericht über das zweite Jahr," &c., *ibid.*, vol. ii., 1855, pt. 2, p. 256. *See also* Roth, "Handbook of the Movement Cure," 1856, p. 277.

[6] "Die Neuere Heilgymnastik" in Schmidt's *Jahrbücher*, vol. lxxxii., 1854, p. 248.

[7] "Die Lingsche oder Schwedische Heilgymnastik" in Göschen's *Deutsche Klinik*, 1852, p. 350.

[8] "Erster Bericht," 1853; "Jahresbericht für 1853"; "Jahresbericht für 1854"; "Jahresbericht für 1855"; "Jahresbericht für 1856 und 1857."

[9] Preface to Branting's "Efterlemnade Skrifter," 1882, p. xxxix.

[10] "Om Sjukgymnastiken vid Gymnastiska Central Institutet under år 1863," 1864, pp. 32-42, 78; "Gymnastiska Iakttagelser," 1865, pp. 69-73. 91; "Årsberättelse i Sjukgymnastik" &c., in *Svenska Gymnastik-Föreningens Tidskrift*, 1866, p. 49; "Kort Framställning om Svenska Gymnastiken .... under året 1870," 1871, p. 22; "Lärobok i Sjukgymnastik," 1870, pp. 193-211; 1883, pp. 197-225; 1892, pp. 194-221; "Gymnastiska Notiser," 1872, p. 20; in *Hygiea*, 1877, pp. 145-154; "Öfversigt af patienter behandlade .... år 1884," in *Tidskrift i Gymnastik*, 1885, pt. 5, p. 293; "Den Mekaniska Agentens Förhållande till Hjertsjukdomar," *ibid.*, 1886, pp. 408, &c., 469, &c.

[11] *See* for example Münchenberg, "Zweiter Bericht," &c., in *Athen. f. Rat. Gym.*, vol. ii., 1885, pt. 4, pp. 319, &c.

II.—To improve the constitution as a whole.

Detailed practical consideration of the above :—

I.—Under this heading it is necessary to refer briefly to the effects of :—

(1) Respiratory movements.

(2) Passive movements at joints.

(3) Active movements.

(4) Stomach exercise, PP.

(5) Manipulations over the heart itself or on its nerves.

(1) *Respiratory movements.*—In the case of most cardiac lesions respiration is rapid and shallow, and frequently it can be seen that during inspiration the abdomen is drawn in. This means that there is a further increase in the already existing impediments to the venous and lymph return in consequence of the cardiac lesion (see p. 126). It is of vital importance that such patients should learn to breathe correctly as soon as possible, and such passive respiratory movements as chest lifting, PP, &c., should be prescribed at once, and their beneficial effect will not fail to be noticed.

Chronic diaphragmatic spasm can also be relieved by means of subcostal shaking, shaking over the bladder and subdiaphragmatic suction.

(2) *Passive movements at joints.* — These, as already stated on pp. 38 to 40, promote the venous and lymphatic flow, and in proportion to the rate and radius through which they are executed, bring about varying degrees of vaso-dilatation of the arteries. Thus the circulation of the blood will be promoted, and the peripheral resistance lowered.

Passive flexions and extensions do not produce such a wide-spread effect as rollings, because the former chiefly affect the flexor and extensor surfaces, whereas the latter affect also the lateral aspects of the parts exercised.

The effect of ringing, PP, on the abdominal circulation has been referred to on p. 88.

(3) *Active movements.*—Duplicate movements are generally administered instead of purely active ones, because their effect and the amount of muscular energy expended is better graduated.

It has already been stated that duplicate movements, properly executed, can be given to cause no extra strain on the heart, because by their means, although the muscles actually involved

contract more powerfully, the co-action of fixators of the neighbouring joints is eliminated, and the patient is never allowed to forcibly hold his breath (see pp. 33, 34).

Hasebroek[1] has given some details concerning the effects of duplicate movements on the blood-vessels. His observations were made with the sphygmograph and sphygmometer. He found that a correctly executed duplicate movement brought about a relaxation (most probably also a vaso-dilatation) in the peripheral arteries. This, in the majority of cases, was followed by an increase in the pressure until the maximum was reached, after which the pressure sank to a point below what it was before the movement commenced; it then slowly returned to what it was originally. The initial rise in pressure was not due to vaso-constriction, but to increased cardiac action, brought about reflexly by impulses from the active muscles. Thereupon the vaso-dilatation that ensued gave the heart rest.

In consequence of the vaso-dilatation in the peripheral parts, there will be a tendency for the quantity of blood in the heart, if excessive in amount, to be diminished, and thus dilatation of the heart, if it exists, will be lessened.

Thus duplicate movements, if carefully executed, result in a strengthening of the cardiac action, and a lengthening of the diastolic period; a beneficial circle is set up. In consequence of the improvement in the cardiac action the blood is pumped more vigorously through the lungs, and the circulation in the coronary arteries (which takes place during diastole of the ventricle) has more time for its adequate performance. Diminution in the diastolic distension of the left heart also favours the flow in the coronary arteries. All this reacts beneficially on the heart.

In short, carefully executed duplicate movements quiet the heart's action.

Patients who are not strong enough to execute duplicate concentric movements can often quite well execute duplicate excentric movements, which almost entirely eliminate any tendency to temporary extra strain on the heart. In the case of very serious lesions passive movements only remain possible.

(4) *Stomach exercise.*—The effects of this have been already

[1] "Über die Gymnastische Widerstandsbewegungen in der Therapie der Herzkrankheiten," 1895.

described at full length : I will therefore only summarise. They are as follows :—

(*a*) Promotion of the arterial and venous flow in the abdomen.

(*b*) Vaso-dilatation in the arteries.

The further effect of the above will be promotion of the abdominal circulation and diminution in the peripheral resistance.

(*c*) Reflex quieting of the cardiac action.

(*d*) Diminution of reflex contraction of the abdominal muscles if such exists, thus improving the muscular respiratory mechanism.

(5) *Manipulations over the heart itself or on its nerves.* These are as follows:—Shaking and vibration, clapping and hacking over the heart ; frictions on the left fourth and fifth dorsal nerves near the spinal column, and hacking on the shoulders. The effects of these have already been considered in detail.

II.—Under this heading falls the consideration of the effects of some of the movements already discussed, *i.e.*, respiratory exercises, passive flexions and rollings, purely active and duplicate movements, stomach exercise ; also of manipulations that stimulate the cerebro-spinal system as a whole, and those that stimulate the kidneys, spleen, &c.

It should here be mentioned that the spleen in some cases of heart disease is tender, even when no signs exist of back pressure in the caval or portal system. Executing spleen frictions or vibrations and frictions on the left ninth and tenth dorsal nerve near the spine will often relieve the patient, and in one case I noticed that the pulse rate sank from five to six beats per minute more at the conclusion of the daily gymnastic treatment if this spleen treatment was included than if it was omitted.

Ling's system is hardly ever found mentioned in connection with gymnastic treatment for heart disease, although frequent references occur to two others, viz., Oertel and Schott. It is necessary to consider briefly the methods of these two latter.

Oertel's[1] treatment consists in reducing the amount of liquid food taken, in dietary precautions, in graduated uphill exercise and a kind of respiratory exercise executed with lateral com-

[1] *See* Oertel's "Allgemeine Therapie der Kreislaufsstorüngen," 1885 (vol. iv. of v. Ziemssen's "Handbuch der Allgemeinen Therapie") and "Massage des Herzens," 1889, &c.

pression of the thorax during expiration. His method is, however, obviously inapplicable to serious cases, such as involve the patient keeping in bed.

Schott's treatment is one which has received a good deal of attention of late. The method, however, is *not* the invention of Schott,[2] in spite of his asssertions that it is. The movements specified by Schott are a few of the most elementary ones of Ling's system executed without due regard either to the initial position or to respiration; and Schott prescribes no passive movements of joints, no chest expanding ones, no local heart treatment and no passive circulatory furthering movements for the abdomen. These defects in the gymnastic methods are to some extent remedied by the use of carbonic acid baths.

Why these two methods should have become so popular and widely known at the expense of other and better ones is not intelligible.

CASE 1.

Mitral Incompetence.

J. H., aged 18, came under the manual treatment on July 20, 1900.

History of present illness.—Four years previously he had suffered rather severely from rheumatic fever, his heart being affected in consequence. The cardiac condition was however not very bad, and four months after the beginning of his illness he was able to resume his lathe work in Huskvarna factory. He consulted many medical men about his heart, and from time to time took various medicines, which, however, did him no good. His condition remained the same until about November, 1899, when he began to feel worse, and suffered from dyspnœa, which was greatly increased on exertion; some cough set in. At Easter, 1900, he was compelled to stop work at the factory.

Examination.—Patient looked weak and thin; his lips were somewhat cyanosed. He complained of a sense of oppression and continual uneasiness in the cardiac region, and sometimes of attacks of palpitation; also of coughing a good deal, bringing up

[2] *See* Th. Schott, "Zur Behandlung der Fettherzens," a paper read at the Eleventh Internat. Med. Congr. at Rome, 1894; "Über Behandlung Chronischer Herzkraukheiten im Jugendlichen Alter," 1899; *see* the references on p. 355.

frothy matter. His sleep remained fairly good. He suffered from breathlessness, which on slight exertion became much worse; even walking at a moderate pace had this effect.

The fourth, fifth, and sixth ribs on the left side in the cardiac region were prominent, and hypertrophied for about 2 inches in their course; over this area cardiac pulsation could be both seen and felt. There was a heaving impulse in the fourth, fifth and sixth interspaces, and the apex beat was most prominent in the fifth space, 1 inch external to the nipple line. A thrill was felt over this area, coincident with the apex beat. Percussion showed enlargement of the heart on the right side. A loud blowing murmur, replacing the first sound, and propagated into the axila, was audible in the mitral area; the second sound was clear in this area. There was marked accentuation of the second sound in the pulmonary area. The aortic and tricuspid sounds were clear.

Pulse 120 per minute, fairly regular; sphygmographic tracing, taken before treatment, is shown in fig. 110.

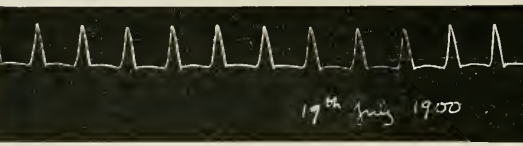

Fig. 110.

The respiration was shallow. The lower ribs, as tested by means of side shaking, were hard, resistent and inelastic. The abdominal muscles were contracted, and did not move with respiration; on asking the patient to make a deep inspiration, the upper part of the thorax moved most, the abdominal muscles being drawn in.

Appetite not good. Motion daily. Urine normal.

While this case was under my charge I ascertained the pulse rate both before and after treatment, as follows:—I requested the patient to come a little earlier than the time originally appointed, and to sit down and keep quiet until I was ready. I then placed him in half lying position, waited two minutes for the pulse to become regular and quiet again, and then counted it. The gymnastic treatment was then administered, and after it the

pulse was counted again, the patient being in half lying position as before.

Treatment as follows :—

(1) Half lying double arm rolling, PP, bending and stretching, AR.

(2) Forwards lying back exercise, PP.

(3) Half lying double foot rolling, PP, flexion and extension, AR.

(4) Heave grasp standing chest clapping, side shaking, PP.

(5) Sit lying knee flexion and extension, PP, extension, AR, flexion, PR.

(6) Loin lean stride standing alternate rotation, AR, ringing, PP.

(7) Half lying double leg rolling, PP, flexion, PA, extension, AR.

(8) Half lying heart shaking, PP.

(9) Walk standing double arm circling, breathing, PA. (This was administered at intervals several times during the daily course of treatment.)

(10) Half lying stomach exercise, PP.

Progress.—The pulse rate was as follows :—

Date.	Before treatment.	After treatment
July 21	120	102
,, 23	120	100
,, 24	125	97
,, 25	120	90
,, 26	110	90
,, 27	102	86
,, 28	100	85
,, 30	95	85
August 1	102	84
,, 2	88	84
,, 3	96	88
,, 4	100	90
,, 5	100	90
,, 6	100	90
,, 8	98	84
,, 9	98	88
,, 11	87	81
,, 14	81	76
,, 20	82	78
,, 24	80	76
,, 30	80	74
September 4	81	76
,, 8	80	72
,, 10	80	72
,, 14	80	72

See figs. 111 to 117 for various sphygmographic tracings taken after treatment.

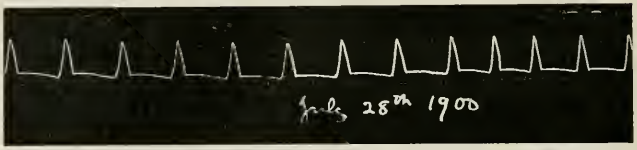

FIG. 111.

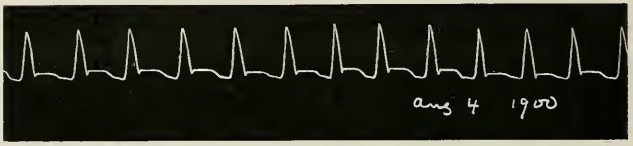

FIG. 112.

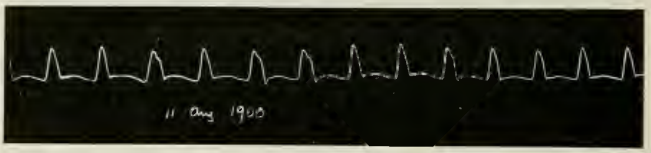

FIG. 113.

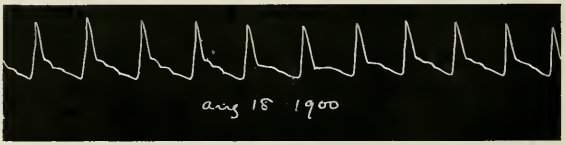

FIG. 114.

September 14.—Treatment finished to-day. Patient said he felt stronger; the lips were no longer cyanosed. He could walk quicker without any breathlessness ensuing, and moderate exertion caused none. He said that he slept better and ate

better. The cough had almost disappeared. There was no sensation of oppression or uneasiness in the cardiac region. The abdominal muscles moved with respiration, and were much less hard and tense. The lower ribs moved to a greater extent with respiration, and were more elastic. The apex beat was about half an inch internal to the nipple, and was limited to the fifth interspace. Percussion showed a very slight enlargement to the right of the sternum. The murmur was as before, but less loud.

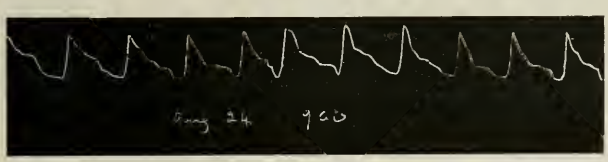

Fig. 115.

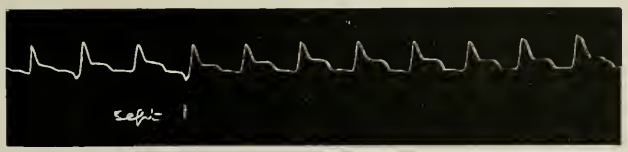

Fig. 116.

Fig. 117.

There was still accentuation of the second sound in the pulmonary area.

Patient resumed work (lathe work) on October 1. I saw him again on November 12. He had been working steadily ever since October 1. He was feeling very well; no unpleasant symptoms had arisen. The heart dulness and sounds were as before; the

pulse, when sitting down, was 82. Sphygmographic tracing is shown in fig. 118.

I saw patient again on March 1, 1901. Patient had been working steadily since October 1, 1900, and said that he felt even better than when I last saw him; he was stronger, and could work better. No unpleasant symptoms had arisen. The

FIG. 118.

size of the heart was about the same as before, the apex beat being about half an inch internal to the nipple line. The murmur in the mitral area was less loud, and there was hardly any accentuation of the second sound in the pulmonary area. Pulse, when sitting down, 72 per minute. Sphygmographic tracing is shown in fig. 119.

FIG. 119.

CASE 2.

Mitral Stenosis and Incompetence.

H. T., aged 13, came under the manual treatment on October 1, 1900.

History of present illness.—He was attacked with rheumatic fever during November, 1899, and was in bed one month. In May, 1900, he had another attack, and was treated at the hospital, where the diagnosis of acute articular rheumatism and mitral incompetence was made. He remained at the hospital until the

middle of June, and then went to a summer health resort; he did not, however, get rid of his rheumatic pains. In August he went through an attack of pleurisy with effusion, which was not so bad as to necessitate thoracocentesis; after it had passed there remained continual rheumatic pains, a tendency to fever, and general weakness.

Examination.—The patient looked weak; his lips were somewhat cyanosed. He complained of continual pains in his wrist, finger and ankle-joints, sometimes also in the knee-joints. All these joints were visibly swollen, and were very tender. There was breathlessness on exertion, and difficulty in walking, the latter, however, due partly to the pain in the ankles and knees. Patient had no subjective cardiac symptoms.

The apex beat could be seen in the fourth interspace, three-quarters of an inch external to the nipple line. Percussion of the

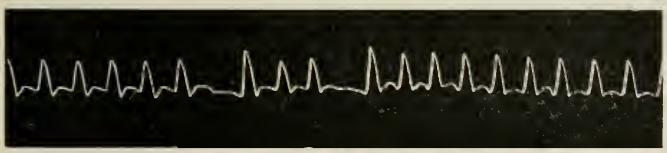

Fig. 120.

right border shows enlargement to the right of the sternum. In the mitral area there was a presystolic murmur, and the first sound was replaced by a blowing murmur, which was propagated into the axilla. There was accentuation of the second sound in the pulmonary area. The aortic and tricuspid sounds were clear.

The pulse was rapid, about 120 per minute, intermittent. The greatest number of intermittencies I ever counted was fifteen in one minute, but as a rule they averaged from five to ten. Sphygmographic tracing is shown in fig. 120. Great tenderness existed over the fourth and fifth left dorsal nerves near the spine. No signs of the pleurisy remained. Temperature, 99°.

Treatment.

(1) Heave grasp standing chest expansion, PA, followed by heart shaking, given together with frictions on the left fourth and fifth dorsal nerves near the spine, PP.

(2) Heave sitting double forearm extension and flexion, AR.

(3) Forwards lying back exercise, PP.

(4) Side lying running nerve frictions, kidney frictions, PP.

(5) Lying double leg flexion, PA, abduction, AR, adduction, PR.

(6) Ride sitting alternate rotation, AR, ringing, PP.

(7) Stretch stride standing bending forwards, PA.

(8) Sitting hand and finger rolling, PP, flexion and extension, AR, joint kneading, PP, &c.

(9) Half lying stomach exercise, PP.

Progress.—The fever ranged from 99° to 101° for a few days; then the temperature became normal and did not rise again. After October 15 it never went above 99·5° in the evening.

October 3.—Fifteen intermissions in the pulse in five minutes.

October 6.—Hand and finger-joints less swollen. Three inter-

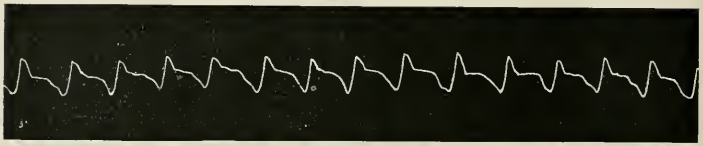

Fig. 121.

missions in the pulse in ten seconds, then none for one minute and forty seconds.

October 10.—No intermission in one and a half minutes.

October 12.—No intermission in two minutes.

October 16.—Pulse commencing to be slower. No rheumatic pains in fingers, wrists or ankles.

October 19.—Pulse rate again somewhat increased.

October 28.—Patient took a walk of three hours. Fingers, wrists and ankles had not swollen since October 16, and did not again become so.

November 1.—Sphygmographic tracing taken; depicted in fig. 121.

November 3.—Pulse below 100 per minute for the first time since October 1.

November 7.—Patient visited Huskvarna factory and was on his feet three hours.

November 9 to 13.—No intermission in five minutes.

November 14.—One intermission in five minutes.
November 14 to 17.—No intermission in five minutes.
November 18.—Treatment finished.

Pulse rate.—Taken after treatment.

October 1	120	October 25	110
,, 2	115	,, 27	110
,, 3	118	,, 29	108
,, 5	114	,, 31	110
,, 8	115	November 1	101
,, 10	118	,, 2	102
,, 12	115	,, 3	98
,, 15	110	,, 5	102
,, 16	102	,, 6	98
,, 17	102	,, 7	96
,, 18	103	,, 8	92
,, 19	110	,, 12	92
,, 22	111	,, 14	94
,, 23	104	,, 16	96
,, 24	110	,, 18	86

The pulse as taken in the evening from November 12 to 18, averaged from 95 to 96.

Examination.—November 18. Patient felt very well and strong; could walk quickly, and even run about a little without unpleasant symptoms arising; had been bicycling in moderation. Appetite, sleep and general appearance better. Lips not cyanotic at all. No subjective cardiac symptoms. No joint symptoms. The apex beat could be seen in the fourth interspace

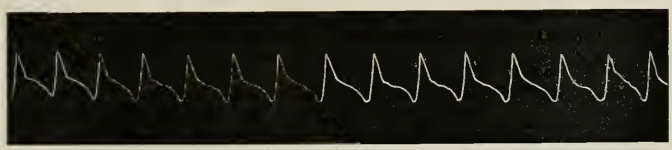

Fig. 122.

in the nipple line. Percussion of the right border showed hardly any enlargement to the right of the sternum. The mitral murmurs could still be heard and there was accentuation of the second sound in the pulmonary area. Sphygmographic curve taken November 17, see fig. 122. The tenderness over the left fourth and fifth dorsal nerves was very slight.

Subsequent progress.—On March 24, 1901, patient's father wrote as follows:—His son's condition was very good. There had been no return whatever of the rheumatic pains. The boy was out during most of the day and played with other boys. He had not complained of any feeling of fatigue to his father after so doing. His pulse was usually 75 during the morning and 90 to 95 during the evening.

CASE 3.

Mitral Stenosis and Incompetence.

A. L., aged 16, female, came under the manual treatment on August 21, 1902.

History of present illness.—When a young child she had had chorea three times, the last time being at 8 years of age, and after the last attack her medical man said that she had heart disease, but not to a serious degree. No cardiac symptoms troubled her until January, 1902, when she had influenza, and remained in bed for a month. After the influenza had passed off she was troubled with shortness of breath, especially on exertion; with a feeling of oppression in the cardiac region; and also with a swelling of her feet and hands, which came on during the afternoon and got worse during the evening. Her condition had been getting slightly worse during the past two months.

Examination.—Patient exhibited the typical flushed cheek and look of mitral disease. There was a slight bulging of the precordia. The apex beat was diffuse and heaving, and could be seen in the fifth and sixth, and also, though very slightly, in the seventh interspace, extending two inches below and one inch external to the nipple. Percussion showed the heart to be enlarged to its left side and also to the right of the sternum. On palpation in the mitral area a presystolic thrill was felt. On auscultation in the mitral area the ordinary first sound was replaced by presystolic and systolic murmurs, the latter propagated into the axilla; the second sound was closed. Auscultation in the pulmonary area revealed a reduplicated first, and a loud slapping second sound. The aortic and tricuspid sounds were clear.

Patient was free from cough. Some œdema of the feet and ankles came on every afternoon, as already mentioned.

After patient had lain down for ten minutes, the pulse was 102 and the respiration 20 Sphygmographic tracing taken before treatment; see fig. 123.

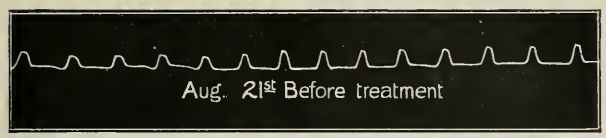

Fig. 123.

Treatment.

(1) Half lying double arm rolling, PP, bending and stretching, AR.

(2) Half lying side shaking, PP, heart shaking, PP, with frictions on the left fourth and fifth dorsal nerves near the spine, PP.

(3) Forwards lying back exercise, PP.

(4) Stretch stride standing bending forwards, PA.

(5) Half lying double foot rolling, PP, flexion and extension, AR.

(6) Heave lean standing chest expansion, PA.

(7) Heave grasp standing chest clapping, PP, side shaking, PP.

(8) Sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(9) Half lying leg rolling, PP, flexion, PA, extension, AR.

(10) Half lying stomach exercise, heart shaking, PP.

The treatment was given daily until September 20.

Examination.— Patient no longer exhibited the typical look of mitral disease, and her general condition was greatly improved. She suffered very little from shortness of breath, and could walk as fast as any of her girl school-friends without getting out of breath. There was no feeling of oppression in the cardiac region and no swelling of the hands or feet.

Heart.—The apex beat, rather heaving in character, was limited to the fifth interspace in the nipple line. There was no enlargement to right of sternum. A presystolic thrill could be felt. Auscultation in the mitral area revealed a presystolic

murmur, but the systolic murmur had disappeared. Auscultation in the pulmonary area revealed no reduplicated first sound; the second sound was slightly accentuated. After patient had lain down for ten minutes the pulse was 78 and the respiration 18. Sphygmographic tracing taken September 18; see fig. 124.

Fig. 124.

Case 4.

Rheumatic (?) Pericarditis, Cardiac Dilatation, and Mitral Disease.

E. B., female, aged 14, came under the manual treatment on August 15, 1902.

Previous history.—Patient had never been very strong; she was small and undeveloped, had always had a rather yellowish complexion and somewhat purple lips, and had always suffered from breathlessness on exertion. Her heart had never been examined.

History of present illness.—On August 13 patient was attacked rather suddenly by shooting pains in the arms and legs, and sharp stabbing pains in the region of the heart; the latter pains disappeared every now and then, and when present were intensified by deep respiration. There was also fever. The following day patient's condition was worse, and as on August 15 it was still worse, I was called in the same morning.

Examination.— Patient was in bed, lying on her back; she said that she was unable to lie on her side. She complained of the pains already specified. Cyanosis was present; the parents said it was more apparent than before her present illness. There was a certain amount of bulging of the precordia. The heart itself was dilated. The cardiac impulse was visible and palpable from sternum to nipple and from the left third rib down

to the left sixth rib; percussion revealed an increase in the dulness to the right. Presystolic and systolic mitral murmur audible, the latter propagated into the axilla; the second mitral sound closed and slapping; the second sound in the pulmonary area accentuated. Aortic and tricuspid sounds clear. No cough or œdema. Temperature 103°, pulse 141, respiration 46. Great tenderness along the spinal nerves and over the kidneys.

Evening. Patient had eaten nothing all day, and was somewhat weaker. Heart about the same as during the morning. Temperature 103·5°, pulse 150, respiration 51. (For temperature, pulse and respiration, see separate chart, fig. 125.)

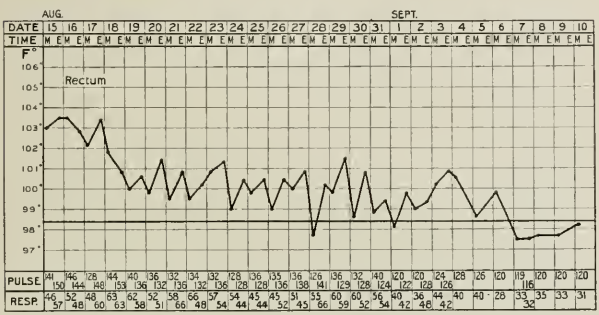

Fig. 125.

Treatment morning and evening.

August 16. Morning. Patient had hardly slept at all, and had been sitting up all night in consequence of great cardiac distress ensuing immediately on trying to lie down. Pain in precordia much worse, often causing patient to cry out. More pains in the arms and legs; considerable dyspnœa, the larynx and alæ nasi working with respiration, which was rapid and shallow. Cyanosis more marked. Heart's action somewhat irregular; dilatation greater, the area of the impulse being more diffuse and extending beyond the nipple; mitral murmurs as before; reduplicated first sound in pulmonary area; aortic and tricuspid sounds clear. Between the nipple and the sternum was audible pericardial friction, which was intensified by pressure with the stethoscope, the latter procedure causing some pain. Treatment.

11 a.m. "Canter rhythm" audible between the nipple and the sternum. Pulse 146. No treatment.

3 p.m. Patient about the same. Pulse 144, respiration 55. Treatment.

7 p.m. Patient worse. Marked orthopnœa, more cyanosis. Distension of abdomen, and great tenderness over the liver. There had been no motion since the 14th. Pulse 150, respiration 60. Treatment.

9 p.m. Patient somewhat better. Abdomen less distended; pain less and pericardial friction less. Pulse 144, quite regular.

Patient had been able to sleep for an hour during the day, but had eaten nothing beyond a piece of bread. No motion yet.

August 17.—Morning. Patient had been able to sleep a little during the night, but had no appetite. Heart better; friction less. Mitral murmurs and sounds in pulmonary area as before. Dilatation about the same.

Afternoon. Patient somewhat worse. Pulse 144, not quite regular; respiration 66. Some biscuits eaten at 6 p.m.

Evening. Patient about the same. Pulse irregular. No motion during the day; abdomen, however, no longer distended. Treatment to-day three times.

August 18.—I was sent for at 4 a.m. as patient had become rapidly worse since about midnight. Patient was in bed, half sitting up, semi-conscious, not answering unless spoken to several times in succession; when she did speak it was only in a whisper, and after great effort. The complexion was bluish-grey, the lips very dark purple; the respiration was laboured and irregular, 72 per minute. The pulse was hardly perceptible; its rate was about 160 per minute. Heart's action very irregular and intermittent, every fourth or fifth pulse beat being lost. Heart very much dilated; diffuse impulse visible from second to sixth interspaces from sternum to one inch outside nipple line, and pulsation palpable to the right of the sternum in the fourth and fifth interspaces, and in the left side up to just below the clavicle. Presystolic, systolic, and diastolic mitral murmurs; reduplicated first and accentuated second sounds in the pulmonary area; these could be quite easily felt through the chest wall with the finger. Aortic and tricuspid sounds muffled, though closed. Pericardial friction the same as during the previous day. No œdema anywhere.

I treated patient for one and a half hours, chiefly with heart vibration, side shaking, and stomach exercise; at the close of this period she was better, and became quite conscious; the pulse also was stronger, more regular, and markedly dicrotic; rate about 150 per minute.

9 a.m. Patient somewhat better; she had been to sleep for an hour. Treatment.

11 a.m. Patient still better, although unable to speak above a whisper; she ate some biscuits. Heart's action stronger. Pulse 142, respiration 60. Treatment.

4 p.m. Pericardial friction ceasing; less cyanosis. Pulse 138, respiration 58. Treatment.

9 p.m. Patient had drunk some milk at 8 p.m., and was better. Apex beat only extended just beyond nipple. Pulse still markedly dicrotic; very few beats missed. Treatment.

Patient had lain absolutely still during the whole day, excepting while eating and drinking, and even the latter actions entailed great exertion. No motion.

August 19.—5 a.m. Patient had been sleeping at intervals until about 3 a.m, when a change for the worse took place. The heart was again irregular, with frequent missed beats, and the pulse very dicrotic, about 135 per minute; the respiration was 44. Treatment for an hour of same kind as early during the previous day.

11 a.m. Patient better. No more pain in the arms and legs, although still a good deal in the cardiac region. Pericardial friction no longer audible. Treatment.

4 p.m. Patient still better; she ate some pudding at 2 p.m. No more dicrotism; pulse quite regular. Dilatation and murmurs as before. Aortic and tricuspid sounds no longer muffled. Pulse 144, respiration 68. A good deal of perspiration during the day. Treatment. Patient drank some soup at 8 p.m.

9 p.m. Patient was still better, and her expression more lively. She was able to move about, and to move her arms and head without distress; she was, however, as yet unable to lie down, and had to keep half sitting up. The apex beat could not be felt or seen outside the nipple. Treatment. No motion during the day.

August 20.—5 a.m. Another change for the worse, although not so marked as during the two previous days. Pulse irregular and somewhat dicrotic, 136; respiration 56. Treatment.

11 a.m. Patient had drunk some milk and eaten some biscuits at 9 a.m. She was a good deal better, and wished to get up and walk about; but on attempting to do so found that she was too weak. After treatment she was carried out of doors, and sat in an armchair for one and a half hours. She still complained of pain in the cardiac region, otherwise was fairly cheerful.

3 p.m. Patient could move her head and arms quite easily. There was less cyanosis and dyspnœa. Pulse 140, quite regular, not dicrotic; respiration 48. Treatment. Patient consumed an egg, some milk and biscuits at 8 p.m.

9 p.m. The parents stated that patient's face, except for some emaciation, looked the same as before her illness. The complexion was yellowish, and the lips somewhat purple. The heart was as dilated as during the previous day; the sounds and murmurs were also the same. There had been some dry cough since the early morning; pulse 132, fairly regular. I took a sphygmographic tracing (for the first time) before treatment (see fig. 126).

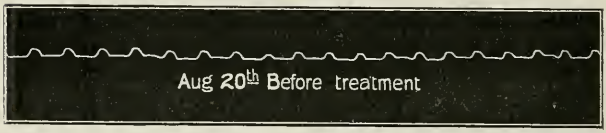

Fig. 126.

No motion during the day; no distension of abdomen.

August 21.—11 a.m. Patient had slept a little; she was able to talk again above a whisper without distress.

4 p.m. Patient had sat out of doors from 12 to 3, and eaten some biscuits and drunk some milk at 2 p.m. Pulse 138, respiration 60. Motion at 6 p.m. (first since August 14). Pain in cardiac region less during the whole day.

9 p.m. Heart not quite so dilated; the apex beat could not be felt further out than half an inch internal to nipple line. Murmurs and sounds as before. Treatment three times a day henceforth.

August 22.—10 a.m. Patient's appetite returning; she had

drunk milk and eaten biscuits for breakfast. Improvement in all subjective symptoms; patient able to move easily; she had even been walking about for a few minutes. Less pain in the cardiac region; very little dyspnœa. After treatment patient sat out of doors for three hours.

3 p.m. No dyspnœa. Cardiac impulse not so diffuse. Patient had consumed some fruit soup for dinner.

No motion during the day.

August 23.—Morning. Sleep still poor. Patient stronger; had eaten veal and bread and drunk some milk for breakfast. She was coughing up a good deal of frothy mucus. No cardiac pulsation in the first interspace, otherwise the condition of the heart was the same as before. Pulse 132, quite regular.

Patient was up and walked about for half an hour during the morning. Dinner at 2 p.m., bread and milk.

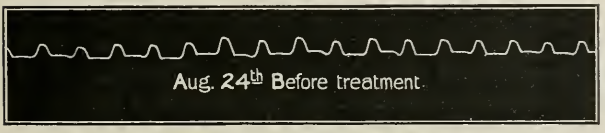

Fig. 127.

4 p.m. Pulse 135, respiration 57. Supper at 8 p.m., bread and milk.

9 p.m. Patient could now lie on her side without distress. No pulsation to right of sternum. No motion during the day.

Treatment twice a day henceforth.

August 24.—Morning. Patient sat up during most of the day, and walked about a good deal. Food: milk, bread and porridge. Motion during the day. Sphygmographic tracing taken before evening treatment (see fig. 127).

During the ensuing four days, the heart remained about the same in size, although its action gradually became stronger. Motion henceforth usually daily, although sometimes every other day.

August 25.—Evening. Pulse 128. Patient up and about the whole day.

August 28.—Evening. Patient somewhat worse; severe pain

in the cardiac region and some dyspnœa. Pulse irregular; occasionally a few missed beats. Heart the same size as before. Sphygmographic tracing taken after treatment (see fig. 128).

August 29.—Patient better.

August 30.—Patient about the same.

August 31.—Patient about the same; was up all day. Both sounds reduplicated in the pulmonary area.

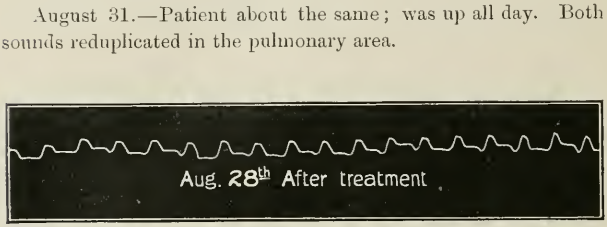

Fig. 128.

September 1.—Patient better; very little pain in cardiac region. Sphygmographic tracing taken before the evening treatment showed a decided improvement (see fig. 129).

September 2.—Evening. No more cardiac pain. Heart still the same size; mitral murmurs as before. Both sounds in the pulmonary area reduplicated.

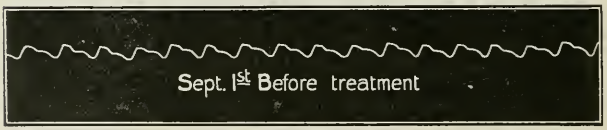

Fig. 129.

September 3.—Patient rather worse again; weaker, and in consequence lay down during most of the day.

September 4.—Patient had slept well for the first time since the beginning of her illness, and was a good deal stronger. Owing to unavoidable circumstances, the treatment could only be administered once a day henceforth.

September 5.—Afternoon. Sounds in the pulmonary area no longer reduplicated; mitral murmurs as before.

September 6.—Patient much stronger; she walked about her room during most of the day. Appetite nearly normal. Sphygmographic tracing taken before treatment (see fig. 130).

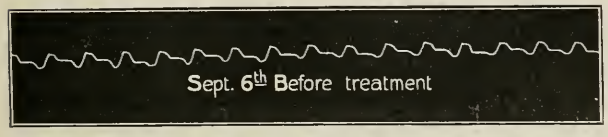

Fig. 130.

September 7.—Patient's sleep steadily normal. Cardiac dulness less, extending only slightly to right of sternum, to second rib above and to half an inch within nipple. During the afternoon patient walked to an open-air party held about 250 yards from home; she sat down and watched the proceedings from 4 to 8 p.m., and enjoyed herself very much. She was wheeled home in a chair. I visited her at 9 p.m. and found her very well.

September 8.—Patient up and about all day; she went for a slow walk of half an hour.

September 10.—Getting stronger every day.

September 11.—Morning. Pulse 114.

September 12.—Patient was able to come to my villa for treatment (distance about 200 yards), and underwent the movements mentioned on p. 379. Pulse before treatment, after patient had lain down quietly for five minutes, 114.

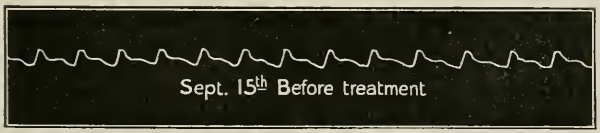

Fig. 131.

September 13.—Pulse before treatment 112.

September 14.—No treatment.

September 15.—Pulse before treatment 108. Sphygmographic tracing taken before treatment (see fig. 131). The area

in which the cardiac impulse could be seen and felt only about two inches in diameter. Triple mitral murmur and accentuated second sound in the pulmonary area. Patient's weight in ordinary clothes, 28 kilos.

Pulse rate was as follows :—

	Before treatment.	After treatment.
September 22	100	96
,, 23	100	96
,, 24	100	92
,, 25	96	96
,, 26	100	100
,, 27	100	94
,, 28	96	92
,, 29	98	92
,, 30	96	92

September 30.—Treatment finished.

October 6.—I saw patient again. She said that she felt fairly strong, and was able to walk about without any inconvenience. She had tried to run, but became breathless. Cardiac impulse in fourth and fifth spaces internal to nipple ; no enlargement to right of sternum. Presystolic and systolic murmur in mitral area, closed second sound. Accentuated second sound in the pulmonary area. Pulse when lying down 94 ; sphygmographic tracing as in fig. 132. Motion daily.

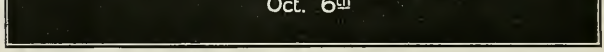

Fig. 132.

Dr. Harry Kellgren sends me the following report on June 17, 1903 :—Patient remained in same condition until February, 1903, when, according to the parents, she had a similar attack to the one just described. She got over it quite well. Present condition :—Patient can run about a fair amount without getting breathless. The cardiac impulse can be seen in the second to fifth interspaces, and the apex beat is most prominent in the fifth interspace slightly external to the nipple line. A thrill can be felt in the pulmonary area. On auscultation in the mitral area a

harsh systolic murmur is heard, propagated into the axilla, followed by a diastolic rumbling sound. Both sounds in the pulmonary area clear, but there is a thrill between the two; marked accentuation of the second sound. Aortic and tricuspid sounds clear.

Pulse when sitting down 84 per minute, strong and regular. Sphygmographic tracing, taken before treatment had been recommenced, is shown in fig. 133.

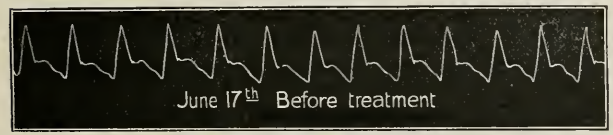

Fig. 133.

In this patient I observed on several occasions that dicrotism of the pulse, if present, could be removed by cervical nerve frictions, which also had the effect of reducing the pulse rate (on one occasion from 150 to 130 per minute) and rendering the cardiac action stronger. (This has been mentioned on p. 162.)

Treatment.

During the acute stage.—Heart vibration and shaking, gentle frictions over the left fourth and fifth dorsal nerves near the spine, chest vibration, side shaking, making patient take several deep respirations; stomach exercise, kidney and spleen frictions; head exercise, cervical nerve frictions.

From August 22 *onwards were added*: Hand rolling, arm muscle kneading, PP; foot rolling, leg muscle kneading, PP.

From August 25 *onwards were added*: Hand flexion and extension, AR, foot flexion and extension, AR.

From August 28 *onwards were added*: Half lying leg rolling, PP, leg flexion, PP, extension, AR; double arm rolling, PP, bending and stretching, AR.

From September 12 *onwards were added*: Forwards lying back exercise, PP; loin lean stride standing alternate rotation, AR, ringing, PP; walk standing double arm circling, breathing, PA.

CHAPTER VII.

DISEASES OF THE BLOOD, LYMPHATICS, AND DUCTLESS GLANDS.

Chlorosis.

The objects of the manual treatment as applied to chlorosis are as follows:—

(1) To aid the digestion, which is usually impaired, and to relieve the constipation so often present.

(2) To further the circulation of blood and lymph by means of movements at joints, and thus to bring more nutritive matter for assimilation and lighten the work of the heart.

(3) To stimulate the nerves of the body generally.

(4) To assist and increase respiration, and thus to supply more oxygen to the body.

All this will act on the constitution as a whole, and enable it to assimilate the iron that is brought into the body by means of the food.

In case of great anæmia of the head, stimulation of the abdominal sympathetic, by causing vaso-constriction of the splanchnic area, will produce compensatory vaso-dilatation of the cerebral arteries, and thus effect amelioration.

Case from notes taken by Dr. A. Möller and myself.

G. A., female, aged 15, domestic servant, came under the manual treatment on November 14, 1899.

History of present illness.—During the autumn of 1898, she began to feel weak and tired, and looked pale. Her medical man diagnosed chlorosis and prescribed iron. No improvement resulted. During the spring of 1899 her condition became worse, and she suffered from headache, breathlessness on slight exertion and constant fatigue. In spite of this she accepted for pecuniary reasons a situation as servant, but became so much worse that she had to go home on November 10, arriving in a semi-

collapsed condition. Menstruation had commenced two years previously, but had been irregular, two months sometimes elapsing between the periods; it had not taken place during the last two months.

Examination.—November 14. Patient was very weak indeed. The complexion was markedly greenish-yellow; the lips very pale. Even such slight exertion as moving an arm or leg was followed by breathlessness; and patient had been in bed ever since she returned home. There was a well-defined mitral systolic murmur and a *bruit de diable*. No cardiac enlargement was present.

After three days of treatment at home patient was much better, and on the fourth day walked to my house for treatment, a distance of about 300 yards. She was, however, still very feeble. She progressed steadily until November 27, when a slight relapse occurred; she was treated at home during that day. On the 28th she was again able to come to me for treatment. Her headache left her, her colour become normal, she grew strong, and her menstruation returned normal in amount and regular. On January 18, 1900, she was quite restored and capable of active work. Treatment finished.

During March she got a temporary situation as nurse. During January, 1901, she went into a laundry, and worked there steadily until July, 1902, when I again saw her; she then said that she was in splendid health.

Treatment.

This at first consisted chiefly of a few passive movements, including stomach exercise. Other exercises were gradually added, and finally the gymnastic prescription was as follows:—

(1) Half lying double arm rolling, PP, bending and stretching, AR.

(2) Stretch half lying running nerve frictions, PP, side shaking, PP.

(3) Heave grasp standing chest clapping, side shaking, PP.

(4) Half lying double foot rolling, PP, flexion and extension, AR.

(5) Stretch grasp standing drawing forwards, PP, kidney frictions, PP.

(6) Forwards lying back exercise, PP.

(7) Stretch stride standing bending forwards, PA.
(8) Sitting trunk extension and flexion, PA.
(9) Half lying leg rolling, PP, flexion, PA, extension, AR.
(10) Half lying stomach exercise, PP.

Lymphangitis.

Under this heading will be considered the treatment of blood poisoning in consequence of infection from wounds, abrasions of the skin, &c.

The manual treatment is applied as follows:—

Locally, running vibrations and frictions, &c., are administered *centrifugally* down to the infected focus in order to prevent the condition spreading upwards, and to endeavour to cause the infective products, if possible, to pass back the way they came. (To apply such manipulation centripetally, *i.e.*, in the direction of the venous and lymph flow, would, of course, only result in great aggravation of the condition, see pp. 205, &c.) Constitutionally, exercises are prescribed to improve the condition of the body as a whole, and to promote elimination of the toxins that have already been absorbed.

I append details of five cases treated by the above method; no antiseptics were used.

Case 1.

E. L., female, aged $13\frac{3}{4}$ years, came under the manual treatment on April 15, 1900.

History of present condition.—During the whole winter patient had had a sore place in the right foot on the anterior surface of the first metatarsal bone at its distal end, caused by wearing tight shoes. Pain was felt in this area during the evening of April 13. During the following night patient slept badly, and the pain got worse during the ensuing day. At 6 p.m. on April 15 I was called in.

Examination.—Patient complained of great pain in the right big toe and over various points on the inside of the right calf. There was continual pain in the lower leg, even when keeping the foot and leg still. Patient could only set her foot on the ground on its outer edge; she could not place it flat on the ground on account of the pain. Walking was almost impossible.

There was an abscess, in which fluctuation could be detected, on the right great toe at the distal end of the first metatarsal; around the abscess there was a red swollen area, extending right across the foot over the distal half of the whole metatarsus; similar areas were visible along the inner side of the calf, as in fig. 134 (the dotted part shows their extent). The entire foot was swollen, all the swollen parts being very tender. The inguinal glands were enlarged. There was fever. The pulse was 92.

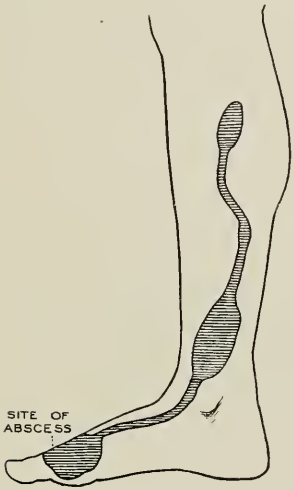

Fig. 134.

Treatment.—Suction vibrations round the abscess, causing the extrusion of a little pus and serum; centrifugal running vibrations along the inflamed area down to the abscess. Vibrations over the inguinal glands; stomach exercise. Result: no pain when foot was kept still; patient able to walk much better and with less pain, even on the whole foot. General condition improved.

April 16.—Morning. Patient had slept very well during the night. Hardly any pain in foot, and patient said she felt as if nothing were the matter with it. Swelling of foot gone; in-

flammation and redness much better. Treatment; a slight amount of pus was expressed from the abscess. After treatment pulse 72. Evening. No pain at all, not even on walking. No tenderness on pressure excepting over the tibialis anticus tendon. No redness along inner side of the calf. Abscess rapidly healing up. Treatment.

April 17.—Patient had slept very well. No pain. Inflammation and redness gone. Treatment once.

April 18.—Foot and leg perfectly normal, excepting for the wound on the big toe, which showed some scabs on it. Patient able to wear boot as usual. Treatment for the last time.

April 19.—Patient went to school, it being the first day of the term.

April, 1902.—Foot had been quite well during the two years which had elapsed.

Case 2.

P. A., male, aged 9, came under the manual treatment on April 2, 1900.

History of present condition.—Patient had hurt his left wrist about four days previously; he did not remember how. Swelling over the joint resulted and during the evening of April 1 he complained of stiffness in the shoulder-joint. On April 2 his mother noticed red lines on his forearm; patient was brought to me at 7 a.m.

Examination.—Two small abscesses near the wrist, out of which the mother had during the same morning squeezed some pus. Large red lines marking swollen lymph vessels along front and external surface of forearm and inner surface of upper arm. Swollen glands in the axilla. Pain on pressure at the spots mentioned at the wrist, and on moving the shoulder-joint; otherwise no pain. Fever.

Treatment.—Centrifugal running vibrations and frictions from upper arm towards wrist; some serum exuded from the abscess cavities in consequence. Stomach exercise, &c. Patient said he felt better in consequence of the treatment. Similar treatment at 11.30 a.m.; patient again sensible of improvement. Treatment at 5 p.m.; patient better; less pain in axilla; no fever.

April 3.—Morning. Patient much better; treatment. Even-

ing. Lymphangitis had disappeared. No pain in axilla. Affected areas near wrist much less red; one of them almost gone, with a little scab remaining. Treatment.

April 4.—Affected areas at wrist practically normal. Arm normal. Treatment for the last time.

September, 1902.—Patient quite well.

Case 3.

A. L., female, aged 9, came under the manual treatment on November 6, 1900.

History of present condition.—Patient hurt her right thenar eminence about November 4 (date not quite certain). On

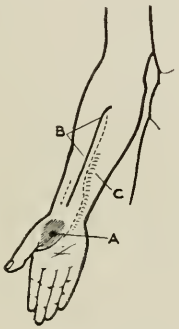

Fig. 135.

November 6 patient noticed that the spot where she had hurt herself was tender and red, and she came to see me about it.

Examination.—There was an inflamed area over the base of the thumb, with a small abscess in the middle (at A in fig. 135). Along the front of the forearm was a red line, which opened into the median basilic vein at the elbow (B). Internal to this was some redness, which extended over the lower half of the forearm (C). The glands in the axilla were swollen. Temperature 101°, pulse 135.

Treatment.—Locally, centrifugal running vibrations, &c., causing the pus from the abscess to be expressed. Constitutional treatment was also administered.

November 7.—No red lines, no fever; pulse 120. Treatment as before.

November 8.—No swollen glands in axilla.

November 9 to 14.—A few centrifugal vibrations were administered every day.

November 16.—No more pus. Wound healed up. Patient normal.

October, 1902.—Patient quite well.

Case 4.

D. A., male, aged 11, came under the manual treatment on November 4, 1900.

History of present condition.—Patient was bitten in his left hand by a rabbit on November 1. On November 4 the bitten place was painful, and there was also pain in the axilla; patient was brought to me.

Examination.—There was a wound about half an inch long with a scab on it, discharging pus, situated over the fifth metacarpal bone. One or two red lines marking out inflamed lymph vessels were visible on the forearm. The whole of the forearm on the ulnar side was very tender to pressure. There were enlarged glands in the axilla.

Treatment on the usual principles. By its means some pus was expressed.

November 5.—Less pain in the axilla. Red lines gone. Some more pus was expressed.

November 6.—Glands in axilla could no longer be felt. Very little tenderness on pressure in forearm. Some pus could still be expressed from the wound.

November 7 to 13.—Centrifugal vibrations were executed for two minutes once a day.

November 13.—Wound healed up. No more pus. Patient cured. Treatment finished.

July, 1902.—Patient quite well.

Case 5.

J. S., aged 26, workman in Huskvarna factory, came under the manual treatment on February 14, 1902.

History of present condition.—Patient had hurt his left hand over the metacarpo-phalangeal joint of the forefinger about a month previously by catching it in some machinery. The wound healed fairly well, but there was slight watery discharge until February 13, 1902. Patient slept badly, and on waking up suffered a good deal of pain in the sore place (which was again inflaming), and also in the forearm; his forefinger was stiff, and there was pain on moving it. During the afternoon of the same day he experienced more pain and more stiffness, and the inflammation was worse; the elbow and shoulder-joints had also begun to hurt. He slept very little, and had fever during the night. He came to me during the evening of February 14.

Examination.—The original wound was much inflamed; it was about the size of a sixpence, with red lines leading from it along the outer side of the forearm and inner edge of the biceps in the upper arm. An enlarged gland could be felt just above the elbow on its inner side, and several others along the inner edge of the biceps and in the axilla. Temperature 101°, pulse 128.

Treatment on the usual principles. By it some pus was expressed, and the patient felt better after it.

February 15.—Patient had slept very well. No pain in wound. Less redness of forearm. Pain in axilla only on lifting arm. Enlarged lymphatic glands smaller. Temperature 98·8°, pulse 80. Treatment twice.

February 16.—Morning. No redness of forearm, glands smaller. A drop of pus was all that could be obtained from the wound.

Evening. Glands not palpable any longer. Wound healing up very well. Treatment for the last time.

October, 1902.—Patient still keeping quite well.

Exophthalmic Goitre.

Miss S., aged 28, came under the manual treatment on March 7, 1902.

History of present illness.—Patient was under Mr. Kellgren's treatment for enlarged thyroid in 1890; the treatment lasted two months, and patient left cured. Since then she had been in good health until 1900. She was confirmed during the summer of that year, and had since been tormented by religious

doubts and fears and had become very emotional. The severe symptoms dated from December 31, 1901. Since that day she had been extremely nervous, irritable, and despondent, and able to sleep only an hour or two at the most in the night; she was easily thrown into tears. She consulted a medical man during January; he diagnosed neurasthenia and prescribed bromides. However, she became steadily worse.

Examination.— Exophthalmos was well marked, and the palpebral aperture wide, the sclerotic being visible above and below the cornea. Patient winked continually, and was unable to keep her eyes still. On looking upwards the forehead did not wrinkle, and on looking downwards the upper lid did not follow the eyeball. Both pupils were dilated, and reacted only slightly to light and accommodation. The tension was + in both eyes, and on ophthalmoscopic examination there was pulsation in the retinal arteries and cupping of the discs. There was great tenderness to pressure over the supraorbital nerves and anterior part of the temporal fossæ. There was a continued sense of fulness in the throat; the thyroid gland was considerably enlarged, forming a tumour about 3 inches from above downward, causing both sterno-mastoids to bulge outwards. The tumour did not extend down as far as the sternum, and the enlargement was equal on both sides. No pulsation was visible, but it could be felt in the gland.

There were fine tremors in the arms on holding them out; the handwriting was very shaky indeed. There was great weakness of all the muscles; patient could hardly offer any resistance in her duplicate movements, and fine tremors of the whole body took place when performing them. Her appetite was poor; she did not suffer from vomiting, but was subject to a good deal of eructations. She was constipated, but able to obtain a motion every other day by drinking Carlsbad water. There was great tenderness over the spleen, liver, kidneys, ovaries and spinal nerves. Patient was troubled with a feeling of throbbing in the arteries, especially in the head. The second sound in the aortic area was accentuated; there were no murmurs. The pulse after lying down for ten minutes was 110 per minute.

Patient suffered very much from headache, sleeplessness, irritability and despondency; and cried easily. Babinsky's sign was not present; tendo Achillis jerk was present, two or three jerks were felt on trying for ankle clonus; the patellar reflexes were greatly exaggerated.

The urine contained a little sugar, as tested by Fehling's solution, but no albumen. Patient had become much thinner of late; her present weight was 53·2 kilos.

Treatment.

(1) Sitting head exercise, PP; suction vibrations on the thyroid gland, PP; double supraorbital nerve vibrations and frictions, PP.

(2) Reach grasp standing head flexion, PR, extension, AR; cervical nerve frictions, PP.

(3) Sitting double elbow pressing downwards, PR, upwards, AR.

(4) Forwards lying back exercise, PP.

(5) Side span standing drawing sideways, PP, spleen and kidney frictions, PP.

(6) Sitting trunk extension and flexion, PA; sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(7) Heave grasp standing side shaking, PP, heart vibration, PP.

(8) Ride sitting trunk flexion, PR, extension, AR.

(9) Half lying stomach exercise, PP, ovary vibration, PP.

Progress.—March 8.—Patient slept better during the night.

March 10.—Patient slept badly again.

March 13.—Patient slept better than she had done for months. Sense of fulness in the throat gone.

March 15.—Less tenderness over the supraorbital nerves.

March 22.—Patient slept very well every other night; was much stronger and able to offer a good deal of resistance during duplicate movements. Less tenderness over spleen, kidneys, liver, ovaries and spinal nerves.

March 24.—Weight 54·5 kilos. Pulse after lying down for ten minutes was 100 per minute.

March 26.—Eyes not so prominent, pupils less dilated; patient wrinkled her forehead slightly when looking up, and the eyelid followed eye downwards. Tension normal in both eyes.

March 27.—Patient slept fairly well four nights running.

April 3.—Thyroid smaller. Less nervous. Tendo Achillis jerk present. No jerks in trying for ankle clonus; patellar reflex not so exaggerated. No glycosuria.

April 5.—Treatment interrupted until April 15. Eyes reacted

normally to light and accommodation; no pulsation in the retinal vessels, but cupping of the discs still present. Some exophthalmos was the only abnormal eye symptom present. Less tenderness over the supraorbital nerves. Thyroid much smaller; very little bulging of the sterno-mastoids. Fine tremors only in hands. Patient stronger, she had taken several three mile walks lately. Appetite normal, bowels acting daily. No throbbing of the arteries. Accentuated second sound in the aortic area still present. Pulse after lying down for ten minutes 88 per minute. Tenderness absent over the spleen and liver but still present over the kidneys and lower dorsal nerves; hardly any tenderness over the ovaries. Patient sleeping very well. Reflexes the same as on April 3. No glycosuria.

Patient returned to treatment on April 15, having been to stay with some friends, who were astonished at the improvement she had made since they last saw her, which was in the middle of February. She had slept very well every night since her departure excepting the last night. Her condition was about the same as on April 5. No glycosuria.

May 17.—Treatment finished. Patient's general condition very good. Slight exophthalmos still present; she winked much less than before, and could keep her eyes much more still. Her forehead wrinkled on looking up; on looking downwards the upper lid followed the eyeball. The pupils reacted normally to light, although sluggishly to accommodation. The tension of the eyes was normal; there was no pulsation of the retinal vessels. The thyroid gland was smaller, but could still be plainly felt. The sterno-mastoids hardly bulged at all. All the muscles were stronger; there were hardly any fine tremors of the hands on holding them out, and none in any other part of the body, not even during strong duplicate movements. The handwriting was normal. Normal motion every other day. Appetite good. No tenderness over liver, kidneys, ovaries, or spinal nerves.

No accentuation of second sound in the aortic area. No throbbing in the arteries; cardiac action much quieter. the pulse after lying down for ten minutes was 70 per minute.

Sleep very good; despondency gone; irritability gone. No tendo Achillis jerk or ankle clonus jerks present. Knee-jerks well marked. No glycosuria. Weight 55 kilos.

I saw patient again on August 9 of the same year. She said she was feeling very well and had grown fatter of late.

CHAPTER VIII.

DISEASES OF THE NERVOUS SYSTEM.

These are conveniently considered under the following heads :—

I.—Organic brain and spinal cord diseases, whether dependent on a sudden lesion such as inflammation or hæmorrhage, or slowly progressive such as sclerosis.

II.—Peripheral nerve diseases such as diphtheritic paralysis, neuritis, &c.

III.—Functional nervous diseases.

IV.—Sympathetic nerve diseases.

I.—Organic Brain and Spinal Cord Diseases.

Want of space compels me to consider only the treatment of the chronic stage of the above diseases.

The object of the treatment is to restore the normal vital activity to the primarily degenerated nerve-cells and nerve-fibres, and to the secondarily affected muscles, &c.

The following movements are employed :—

(1) Manipulations which stimulate the central nervous system directly, especially nerve frictions, local and general. The affected motor nerves are treated by means of nerve frictions, stationary or running, hackings, &c. The affected sensory nerves are treated by means of nerve frictions, stationary or running, clappings, &c. The spinal cord is treated by means of peripheral nerve stimulation as just mentioned, hackings over it, strong vibration over any affected segments, &c. The brain is treated by means of a short, sharp head exercise, with particular attention to any specially affected area. The cerebro-spinal system as a whole is treated by means of running nerve frictions from head to foot, &c.

(2) Passive manipulations on any weakened or paralysed muscles.

First and foremost, nerve frictions on the motor nerves leading to the muscles, as already mentioned.

Secondarily, passive flexions, extensions, rollings, &c. For atrophic conditions these are administered energetically through the largest radius in order to cause: Promotion of the circulation of the blood, and subsequently a vaso-dilatation in the part exercised, and promotion of the circulation of the lymph with increased production thereof. Stimulation of the nerves and muscles from alternate elongation and shortening and from the reinforcement of the reflex arc through shortening of the antagonistic muscles. For spastic conditions where there is no atrophy beyond the atrophy of disuse, passive movements at joints are administered in a different manner. They are executed fairly slowly; as soon as spasm arises the movement is wholly or partially stopped, and an endeavour made to overcome the spasm by gently elongating or shortening the muscle or muscles in which the spasm has arisen. When it has been overcome the movement is again continued. There is also a psychical encouraging effect; the movement executed is one which perhaps the patient himself has been unable to achieve for years past and of which he has forgotten the sensation. He is thus encouraged to attempt its repetition.

Thirdly, kneadings of any affected muscles. In atrophic conditions these have a certain amount of stimulatory effect, but by no means so marked a one as stimulatory manipulations on the nerves supplying these muscles. It must be remembered that the atrophy is practically always secondary to the nerve degeneration, and that, therefore, stimulating the muscles directly by kneadings, &c., cannot have the same effect as stimulating the nerves directly by frictions.

(3) Active movements, purely active or duplicate, during which the patient has to try his utmost (within the physiological limit) to move any paralysed muscles or ataxic limbs, *i.e.*, the patient has to try his utmost to restore the continuity in the interrupted motor or sensory paths. Such voluntary efforts excite the nerve-cells to increased activity, and aid in the restoration of the degenerated nerve-fibres; each renewed effort of the will sends down a fresh nervous impulse which

tends to overcome any obstruction. Such movements also train ordinary sensation[1] and the sense of coördination and inhibition.

By means of various fixations of the limb all other muscles may be placed at rest except those it is desired to exercise, on which the patient is thus enabled to concentrate all his energy.

(4) Manipulations to improve the general condition of the patient, *e.g.*, to better the circulation and promote the activity of the assimilative and digestive organs. Special attention should be paid to any secondarily affected organs, such as heart, bladder, &c.

It is advisable to refer here to some points in the technique of the application of active movements to cases of paralysis. For purposes of illustration it is convenient to take a case where, in consequence of the anterior tibial muscles being affected, the patient states that he is unable to bend his foot by himself. It does not, however, follow in consequence of his statement that there is no voluntary muscle power in the anterior tibial muscles; it is necessary to test further, as follows:

(*a*) The patient is exhorted to try his utmost to bend his foot; after a few seconds, or perhaps even only after a minute, a very slight amount of movement may manifest itself. This arises from summation of voluntary stimuli.

(*b*) The patient's ankle-joint is flexed as far as it will go, and the patient then asked to resist his utmost while the reverse movement is executed. Some resistance may be felt (see pp. 37, 38).

(*c*) The patient's ankle-joint is slowly flexed, the patient being requested to assist as much as possible. Some assistance may be felt (see p. 13).

In some cases, even if the results are negative, voluntary power can sometimes be elicited after executing strong nerve frictions on the anterior tibial nerve followed by an energetic foot rolling given through the largest radius.

It is often useful to eliminate the action of gravity, *i.e.*, supposing a patient unable to abduct his right leg in left side lying position, he may yet be able to do so in half lying position, and so on.

The golden rule for treatment of paralysis is: Try and teach

[1] *Cf.* "Optic Atrophy and Tabes Dorsalis," by the author, in *Lancet*, June 29, 1901, p. 1861.

the patient to regain the voluntary power of those movements which he has lost in consequence of the nervous lesion.

The treatment of crises such as occur in locomotor ataxia.—Special exercises should be administered for the benefit of the part affected during the crises, *i.e.*, during gastric crises exercises chiefly for the stomach and abdomen should be administered, and so on. During one case of locomotor ataxia of eight years' standing that I treated in October—November, 1900, there occurred two gastric crises with fever; the treatment (twice a day) was as follows: stomach vibration, frictions on the left sixth, seventh, and eighth dorsal nerves near the spine, stomach exercise; general treatment for fever. The improvement in the patient's condition, which otherwise proceeded slowly, was marked for the two days immediately following each crisis. This tends to show that in some cases such crises can act as general eliminators, and that they might therefore be regarded as an effort of Nature towards attempting a cure.

II.—Peripheral Nerve Diseases.

(1) Neuritis (excluding neuralgia). Is treated in very much the same way as atrophic spinal paralysis.

(2) Neuralgia. Is treated by means of sedative manipulations, such as vibrations over the painful nerves; gentle passive movements at joints can be added where this is possible. As improvement sets in, frictions on the painful nerves are made use of; more energetic passive movements, duplicate movements, &c., can be added when possible.

(3) Spasm of muscles from nervous causes. Is treated by means of stimulatory manipulations on the nerve, and by exercises to strengthen the antagonistic muscles (see p. 75).

III.—Functional Nervous Diseases.

It is impossible to lay down any general directions for the treatment of these; each case has to be taken on its own merits.

IV.—Sympathetic Nervous Diseases.

These conditions are not ordinarily accorded a place in text-books. It is, however, often found while examining a patient,

say, for dyspepsia, that there is greatly diminished sensation in the abdominal prevertebral plexuses, or that no radiating sensation is experienced on executing a friction on the umbilicus, &c. This leads to a diagnosis of deficient functionability in the sympathetic nerves of the part, although it is generally very difficult indeed to say whether this sympathetic condition is primary or secondary.

It is, however, impossible to give a comprehensive account of the subject, or to lay down general directions for treatment; each case must be taken on its own merits.

I wish especially to emphasise the fact that the manual treatment should be given a trial as early as possible in cases of organic disease of the central nervous system, because experience has shown, particularly in slow degenerative processes such as sclerosis, &c., that very little improvement can be expected in most cases from the administration of drugs and electricity. Cases treated by such methods without improvement are usually difficult to benefit by the manual treatment; cases treated by such methods with improvement generally improve faster when the manual treatment is substituted. Cases which have never received any treatment, even if of many years' standing, are often more easy to benefit by means of the manual treatment than correspondingly recent cases which have not improved under ordinary medicinal or electrical treatment. I have also had some opportunities of observing that cases which have improved by means of the manual treatment, and which have then for various reasons been removed from its influence and brought under that of drugs and electricity, nearly always either remain stationary or, in sclerosed conditions, become worse again; whereas cases which have improved by means of the manual treatment sometimes continue to do so after the treatment has been stopped, provided that none other be made use of.

I append a list of all the nervous cases I have been able to watch carefully, and in which there has been no doubt in my mind as to the diagnosis. By "cured" I mean that the patient was freed from all abnormal nervous symptoms, and that such cases were under observation at least one year, in many cases up to four years, from the date at which the manual treatment

was concluded, and that during that time no return of any abnormal nervous symptom took place.

In all the other cases mentioned excepting two (see p. 397) improvement resulted from the treatment.

Neuritis and neuralgia.—Sciatica, seven cases; three cured. Tic douloureux, one case. Retrobulbar hæmorrhage with optic atrophy, one case. Other neuritis, eight cases. Other neuralgias, ten cases; five cured.

Post-diphtheritic paralysis, two cases; one cured.

Convulsive tic, one case; cured.

Facial nerve paralysis.—Peripheral, two cases; one cured. Central, one case.

Congenital paralysis of brachial plexus, one case; cured.

Gunshot paralysis of ulnar and median nerves, one case.

Spinal transverse myelitis, one case.

Apoplexy of the spinal cord, two cases; one cured.

Infantile paralysis, eighteen cases; two cured.

Spastic paraplegia, seven cases.

Locomotor ataxia, eight cases; two cured.

Compression of the spinal cord from scoliosis, one case.

Tertiary cerebro-spinal syphilis, one case.

Amyotrophic lateral sclerosis, one case.

Gunshot wound of spine at level of fifth dorsal vertebra, one case.

Bulbar paralysis, three cases.

Sequelæ of secondary syphilitic meningitis, one case.

Hyperæmia of the brain, four cases; three cured.

Cerebral hæmorrhage and embolism, six cases; one cured.

Cerebral subdural hæmorrhage, one case.

Infantile spastic diplegia, two cases.

Disseminated cerebro-spinal sclerosis, three cases.

Hydrocephalus, five cases; one cured.

Paralysis agitans, six cases.

Sequelæ of concussion of the brain, three cases.

Delirium tremens, one case; cured.

Chorea, two cases; both cured.

Epilepsy.—Grand mal, four cases; one cured. Petit mal, one case; cured.

Writer's cramp, two cases; one cured.

Hysteria, fifteen cass; five cured.

Neurasthenia, mental overstrain, &c., thirty-two cases; eleven cured.

Raynaud's disease, one case.

Syphilitic dementia, one case.

Mania, four cases; two cured.

Melancholia, one case.

Insanity of menstruation, one case; cured.

The treatment was without effect in the following cases:— A child, aged 9, suffering from cerebral hæmorrhage of four years' standing. Previous treatment: drugs and electricity. Duration of the manual treatment: three weeks.

A man, aged 42, suffering from spastic paraplegia (spinal) which ran a rapid course: The patient first noticed that something was wrong during June, 1899; he was compelled to cease work during July, 1899. During August and September of the same year he underwent five weeks of electrical treatment. Duration of the manual treatment: October 1, 1899, to January 10, 1900. Patient died during October, 1900.

Embolism into the Internal Capsule.

H. A., female, aged 39, came under the manual treatment on August 8, 1900.

History of present illness.—Patient had been suffering since 1876 from heart disease, which was quite well compensated. During March, 1899, she had an attack of influenza, and got up too soon after it. A relapse took place, and during the night of April 1, 1899, she suddenly lost consciousness for an hour and awoke with complete paralysis of the left side of the body (face, arm, and leg), with transient aphasia which lasted twenty-four hours. After stopping at home for two weeks she was taken, on April 17, 1899, to the hospital in Hvetlanda, where she remained until May 19, 1899. Her condition did not improve much; some power of movement at the elbow and slight power of movement in the lower extremity returned gradually.

She then went to a convalescent home, and took baths for two months from June 1 to July 31, 1899. She then left, and underwent electrical treatment for a month, after which she went home. No further treatment was taken until May, 1900, when massage was resorted to; this was continued until August, when patient came to me.

She said that none of the treatment undergone had ever seemed to do her any good worth mentioning, and that she only improved at the same rate (a very slow one) while massage or electricity was being administered as while not under treatment at all.

Examination.—Patient still had some facial paralysis on the left side; when smiling the right side of the mouth drew back, but the left remained stationary. She walked very slowly with the help of a stick, and swung her left leg round in a semi-circle. On her journey to Sanna she had to walk from one station to another; the distance was only three-quarters of a mile, but took her three hours to accomplish.

Left side of body: Reflexes.—There was slight knee clonus, and some ankle clonus; the patellar reflex was exaggerated. There was a biceps jerk, but not an extensor one. Frictions on the posterior interosseous nerve caused twitching of the fingers (dorsiflexion). Frictions over the musculo-spiral nerve produced this to a less extent. Repeated frictions on the internal plantar nerve caused a little flexion of the hip-joint (see p. 151).

Most of the muscles were stiff in the affected areas, excepting in the thigh, where some of them were flabby; there was, however, no actual wasting. Occasionally involuntary spasmodic movements took place in the fingers, but nowhere else.

Voluntary movements:—

Shoulder-joint.—Flexion, fair, through angle of 90° or so. Extension, hardly any. Internal rotation, good. External rotation, very little. Abduction, arm could not be abducted to right angle. Adduction, good. Elbow pressing backwards, upper arm could not be pressed backwards to form less than 45° with coronal plane. Patient could not put her arm in neck firm position, or keep it there when so placed for her while she was in half lying position.

Elbow-joint.—Flexion, good, but muscles very stiff. Extension, weak.

Radio-ulnar joints.—Supination, impossible to more than mid-position. Pronation, good.

Wrist and finger-joints.—Flexion, normal, but patient unable to close her fist. Extension, hardly any; extension of thumb a little better than that of fingers.

Hip-joint.—Abduction, weak. Adduction, normal. Flexion, very little. Extension, fair. Rotations, very weak.

Knee-joint.—Flexion, very weak. In forward lying position patient was unable to lift her foot off the couch, although she was able to contract the hamstring muscles. Extension, good.

Ankle-joint.—Flexion, none. Extension, good.

Toe-joints.—Slight movements possible.

Face.—See above.

Sensation was quite good in the paralysed area. The pupils were normal.

Heart symptoms.—Patient complained of a continued anxious feeling in the cardiac region. The cardiac impulse could be seen in the fifth and sixth spaces in the nipple line. On percussion, there was some enlargement to the right of the sternum. On auscultation, great arhythmia with pauses and intermissions; the sounds were very indistinct, varied very much, and occasionally almost disappeared for a few beats. A diastolic murmur could be heard in the mitral area; it was slightly propagated into the axilla. Pulse about 150; there was, however, great difficulty in counting it, owing to the great irregularity. Sphygmographic tracing taken before treatment see fig. 136.

Treatment.

(1) Sitting head exercise, PP, including frictions on the left facial nerve, PP.

(2) Sitting left arm exercise, including arm abduction, AR, adduction, PR; supination, AR, pronation, PR; elbow extension, AR, flexion, PR; finger and wrist extension, AR, flexion, PR; nerve frictions, specially on the posterior interosseous nerve, PP.

(3) Half lying double arm rolling, PP, bending, PR, stretching, AR.

(4) Half lying double foot rolling, PP, flexion and extension, AR.

(5) Forwards lying back exercise, PP, knee flexion, AR, extension, PR.

(6) Half lying leg rolling, PP, flexion, AR, extension, PR.

(7) Half lying stomach exercise, heart vibrations, side shaking, PP.

Extra movements were often included, but the above formed the general prescription. All the movements had to be adminis-

tered carefully, in consequence of the cardiac condition. In many cases the first part of the duplicate movements, as in (2), were given PP at first, then PA, and then AR, gradually increasing resistance being offered as the patient's strength came back.

Fig. 136.

Progress.— August 8.—After the first treatment the toes already able to move a little better.

August 9.—The heart quieter, according to the patient. Less

feeling of anxiety in the heart, which could be felt to beat more slowly but just as irregularly.

August 10.—Patient able to abduct her arm to more than a right angle. The extensors of the forearm stronger. Movements of the toes a little better. Patient able to walk better. The anxious feeling in her heart quite gone.

August 15.—The facial paralysis disappeared. The extensors of the forearm and abductors of the shoulders stronger. Patient able to walk better and without using a stick.

August 21.—Improvement continued. Complete supination possible.

August 24.—Extensors of forearm and abductors of shoulder stronger; abduction now possible through 120°.

September 3.—Abduction at the shoulder possible through 135°. The elbow could be drawn back to form an angle of about 22° with the coronal plane.

September 15.—Further improvement in abduction, which was now possible through 150°. Patient could, in forwards lying position, flex her knee a little and resist during extension. The stiffness of the muscles previously felt while administering leg rolling and arm rolling almost gone, but the range of passive flexion and extension at the ankle not complete; the toes able to move through an arc of only about 2 inches. Patient able to use the fingers of the left hand to button her clothes if the buttons were in a convenient position in front.

September 18.—Patient took a walk of four miles, half of which was very much uphill.

October 1.—Treatment now as follows:—

(1) Sitting head exercise, PP, frictions on the left facial nerve, PP.

(2) Heave grasp standing drawing forwards, PP, heart vibration, PP.

(3) Sitting left arm exercise, as before.

(4) Half lying double foot rolling, PP, flexion, AR, extension, PR.

(5) Half lying double arm rolling, PP, bending, PR, stretching, AR.

(6) Forwards lying back exercise, PP, knee flexion, AR, extension, PR.

(7) Half lying leg rolling, PP, flexion, AR, extension, AR.

(8) Half lying stomach exercise, heart vibration, side shaking, PP.

October 3.—Abduction of arm possible nearly up to the vertical. Elbow could be drawn back to coronal plane.

October 14.—Left arm could be placed in neck firm position (when patient in half lying position), and kept there with difficulty.

October 23.—Patient able to extend fingers and wrist to lie in straight line with forearm.

November 1.—Patient able to extend fingers and wrist to more than a straight line with the forearm; able to walk quicker. Flexion of knee better.

November 5.—Extension of thumb, PA, normal.

November 28.—Sphygmographic tracing taken to-day half an hour after treatment, see fig. 137.

Fig. 137.

Examination.—December 20, 1900. Patient able to walk much better than when she first came to me. The reflexes about the same as on August 8.

Voluntary movements :—

Shoulder-joint.—Flexion, good. Extension, weak. Internal rotation, normal. External rotation, good, possible with a good deal of AR. Abduction good, possible to nearly the vertical. Adduction, good. Elbow pressing backwards, very good.

Elbow-joint.—Flexion, normal. Extension, possible to a straight line.

Radio-ulnar joints.—Supination, possible to full extent with AR. Pronation, good.

Wrist and finger-joints.—Flexion, patient able to close her fist. Extension, fingers and wrist capable of extension to a straight line, or even a little more sometimes. Complete extension of thumb possible with AR.

Hip-joint.—Abduction, normal. Adduction, normal. Flexion, good. Extension, very good. Rotations, very little improvement.

Knee-joint.—Flexion, in forwards lying position patient able to flex the knee to a right angle and resist in extension, PR. Extension, good.

Ankle-joint.—Flexion, good. Extension, normal.

Toe-joints.—Flexion, fair. Extension, good.

Face.—Normal.

Heart symptoms.—The apex beat nearer the sternum than before. The area of cardiac dulness less than when she first came under the manual treatment. On auscultation the diastolic murmur not so distinct as it was; the heart sounds less faint and the irregularity less. Sphygmographic tracing (see fig. 138).

Fig. 138.

Infantile Spastic Diplegia.

A. J., male, aged 3, came under the manual treatment on August 8, 1901.

History of present illness.—Patient was a first child; the labour was not abnormal, no forceps being used, and from first to last occupied about twenty hours. The condition of spastic diplegia was, however, noticed soon after birth, and had persisted ever since with hardly perceptible change. Several medical men who were from time to time consulted pronounced the condition to be incurable.

Examination.—I am indebted to Dr. Harry Kellgren for the following description of the patient's condition on August 8. Face expressionless, very pale. Head large, hydrocephalic looking, circumference 55 cm. Intelligence weak, patient could hardly talk at all; his vocabulary was limited to five or six words. No nystagmus. Patient continually in the attitude characteristic of his disease—upper arms adducted and rotated internally; elbows

semi-flexed, forearms pronated, hands semi-flexed and meeting anteriorly across the chest. Thighs markedly adducted, semi-flexed, rotated inwards; knees semi-flexed, feet extended and inverted. Spine somewhat kyphosed.

General weakness of all muscles. Cervical extensors very weak; patient unable to hold his head up; it always fell to one or other side unless supported. The arm muscles flabby, those of the legs somewhat spastic. The contraction in the adductor muscles so strong that the knees could passively be only very slightly separated. Patient unable to sit up unless with a great deal of support; and unable to stand up against a wall unless with very complete fixation, the least relaxation of the support causing him to fall down in a heap. Arms very rarely moved; attempts to get patient to move them voluntarily quite unsuccessful. Legs often moved; and patient would move them when ordered to do so, although he was apparently unable to perform half lying leg extension, PA, after the thigh and knee had first been passively flexed. Patient unable to straighten his spine voluntarily.

Reflexes. Eyes reacted sluggishly to light. Babinsky's sign and Kellgren's plantar sign present. Tendo Achillis jerk, ankle clonus, and adductor jerk present on both sides; no knee clonus or crossed adductor jerk. Patellar reflexes very exaggerated. The reflexes of both legs about equal. No reflexes in the upper arms. Defæcation: for the first six months of his life patient was constipated, and an enema was administered daily. After that time the reverse condition set in, and patient had since had seven or eight motions per day. Micturition: this was frequent, often every hour during the daytime and severaltimes during the night. No incontinence either of fæces or urine; patient had learnt to give the sign to his nurse when he wished to empty rectum or bladder.

Treatment.

(1) Sitting head exercise, PP.

(2) Half lying double arm rolling, PP, bending and stretching, AR, arm nerve frictions, suprascapular nerve frictions, PP.

(3) Stretch grasp standing drawing forwards, side shaking, PP.

(4) Half lying double foot rolling, PP, flexion and extension,

AR; double leg rolling, PP, flexion and extension, AR, leg nerve frictions, PP.

(5) Crook half lying double knee abduction, AR, adduction, PR.

(6) Forwards lying back exercise, PP.

(7) Sitting trunk extension and flexion, PA; sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(8) Stretch half lying running nerve frictions, PP, shaking over the bladder, PP.

(9) Half lying stomach exercise, PP.

(10) Patient was made to try and walk, and to stand with as little support as possible.

The above exercises could not, of course, be executed at once with the proper resistance; several weeks of careful training were necessary before the patient could learn what to do.

Progress.—I first saw patient on October 1. He was already better. The face had more expression, was more lively and had more colour. Patient was able to hold up his head by himself, and if properly balanced could sit up by himself without support for ten or fifteen seconds. He could also flex and extend arms.

October 11.—While receiving forwards lying back exercise, PP, patient held up his head quite well.

October 15.—When held up under both arms, patient was able to put one foot in front of the other so as to walk along, though this was accomplished with a good deal of difficulty; the right leg moved more easily than the left.

October 17.—While in forwards lying position, patient was able to resist while his head was pressed down on to the couch, and also to raise it again with AR. He had to a great extent lost the characteristic attitude of his disease.

November 9.—Cervical extensors still stronger. Walking (with support) better. Patient able for the first time to stand upright with his back against a wall with hardly any support. He could now perform half lying leg extension, AR.

November 18.—Patient able, when holding on to a sofa for assistance, to walk a few steps.

November 23.—Intelligence improved; face more expressive and of quite a good colour. Head smaller, and usually held up. Patient able to sit up by himself with only his back supported sometimes for fifteen or twenty minutes without falling; and

able, when holding on to a sofa, to walk fairly well. He went home for two days, but in consequence of his nurse leaving suddenly while at home, and his mother being unable to get another, he did not return to treatment. Winter set in, and his mother thought it better to keep him at home until the spring.

During the winter patient had whooping cough, and a very bad attack of acute tonsillitis. He returned to treatment on May 5, 1902.

The characteristic attitude of the disease had partly returned; the forearms were constantly pronated, and there was more adductor contraction than during November. He was still able to hold his head up quite well. His intelligence was much improved, and he talked a good deal. He was unable to walk as well as when he left; this was owing to the fact that his parents had not encouraged him to try and do so. Reflexes about the same, with the exception that there was no ankle clonus on the left side.

Gymnastic prescription same as before.

The treatment was continued until July 1, 1902.

Examination.—July 1.—Patient had a lively expression, and talked and laughed like other children; his speech was that of a child about 3 years of age. Head smaller, circumference 53½ cm. His intelligence was much improved; he understood everything that his nurse told him. The characteristic attitude of his disease was gone; very little adductor contraction was left. He was much stronger, and able to use his arms and hands quite well; he could, for example, take up a cup with both hands, drink out of it and set it down again without upsetting it.

He was able to sit in a chair without support for periods sometimes as long as ten minutes. If he held on to the back of a sofa, he was able to walk along it, though this was done clumsily. He could stand quite easily if allowed to hold on to a chair. He had learnt to do all the duplicated gymnastic exercises quite well, and could offer a good deal of resistance during crook half lying double knee adduction, PR.

Reflexes. The eyes reacted normally to light. The reflexes of the left leg were not so marked as those of the right. Babinsky's sign manifested itself in the right foot only after repeated efforts; no tendo Achillis jerk; no ankle clonus

in the left foot, one or two jerks in the right foot. The patellar reflex was more exaggerated on the right side than on the left. Defæcation and micturition were practically normal.

I again saw patient on September 16, 1902. His general condition was improved. He was as intelligent as any ordinary child of the same age. His memory seemed quite up to the standard. He used his arms quite easily. There was hardly any adductor contraction, and he was able to walk for an hour if he held on to something. Patient had, however, lately been having cramp in the muscles of his feet. The reflexes were more marked than on July 1; Babinsky's sign was easily obtainable in both legs; ankle clonus was easily obtainable in right foot, and one to two jerks in left foot. Defæcation and micturition normal.

Diplegia from Cerebral Hæmorrhage.

G. C., female, aged 9, came under the manual treatment on January 7, 1902.

History of present illness.—Patient had always been well until December 27, 1899, when she was the subject of an apoplectic seizure. She was heard during the night to scream suddenly; for several hours after that she suffered from violent convulsions, retraction of the head, rolling up the eyes so that only the whites were visible, and screaming at intervals. The parents did not notice that the head was turned to any particular side. During all this patient was profoundly unconscious. After a few hours she quieted down somewhat and finally went to sleep. On waking up the following morning she seemed in a stupor, and was entirely unable to move any part except her head; and her mother on trying to move her found that she was very stiff. Motor aphasia was present, and incontinence of fæces and urine. After a week or so partial power of movement was restored, commencing in the legs, and patient was able to say one word—"Mamma." Speech improved slowly, and was restored at the end of a month; but patient was unable to move much, and remained in bed during eight months. The stiffness of the body and extremities improved slowly, and during May, 1900, she could sit up, but not stand. During August, 1900, she could stand and walk a few steps when her mother supported her on one side, using a stick on the other. During the following summer

she was able to waddle along very slowly and clumsily without help. Since then her condition had remained about the same.

Several medical men were consulted, who at different times prescribed various medicines, but none seemed to do her any good. Since the summer of 1901, five medical men, consulted separately, declared that no improvement was possible by any method whatsoever.

Examination.—January 7, 1902.—Patient walked extremely clumsily; she was unable to progress in a straight line, and moved sideways, taking very small steps in a more or less circular path; her body swayed about very much in so doing. She was unable to lift either foot more than one inch off the ground. There was internal rotation and adduction of both thighs, and inversion of both feet, so that while walking patient kept her toes almost touching and her heels at least 6 inches apart, being supported on the outer side of both feet. The right arm was kept constantly with the upper arm somewhat abducted, the elbow semiflexed, the forearm pronated, and the wrist and fingers flexed; the arm could be passively straightened so as to hang vertically, but the least disturbing sound or putting a question caused it at once to resume its former position.

Sensory phenomena.—Patient was perpetually scratching herself on the right arm and leg in consequence of itching feelings in the skin; these were present to a less extent in the left hand and foot. She also complained of constant pins and needles sensations in the right hand and both feet. She generally referred a touch on the right leg to the left one, and could not well locate points touched on the right leg. A touch on the right arm was sometimes referred to the left arm. There was diminished sensation in the right hand and both feet. Sensation in the left arm and leg was referred correctly. There was no cold shivers sensation on receiving cervical nerve frictions, nor any sensation in the hand or any part of the arm except at the point of application when receiving frictions on the brachial plexus in the axilla, nor in the lower leg or foot when receiving internal popliteal nerve frictions.

The sight appeared to be normal; I could not test patient with the test types, as she had never learnt to read. No reaction to accommodation was present, although that to light was partially present. Ophthalmoscopic examination revealed nothing

abnormal. Hearing: Right ear $\frac{15}{50}$, left ear $\frac{24}{50}$. Taste and smell were normal.

Reflexes.—Swallowing normal. Micturition: there was perpetual incontinence of urine, which patient did not notice more than about once an hour or so, when apparently a larger quantity than usual was discharged. Defæcation: patient had at least three loose motions during the day, and the same number during the night; she felt them coming, but could not keep them in more than half a minute or so.

The skin reflexes, including Babinsky's sign, were absent. Other reflexes were as follows:—

	Left side.	Right side.
Kellgren's plantar sign	yes ...	yes
Kellgren's crossed plantar sign (see p. 151)	no ...	yes
Tendo Achillis jerk	yes ...	yes
Ankle clonus	no ...	no
Patellar jerk	exaggerated ...	much exaggerated
Knee clonus	slight ...	one kick back
Adductor magnus jerk	yes ...	no
Crossed adductor jerk	no ...	no
Extensors of forearm jerk	no ...	no
Supinator longus jerk	no ...	no
Biceps jerk	no ...	no
Triceps jerk	no ...	no

Motor functions.—The walk has been described. Patient was very restless, perpetually on the move; there were continual involuntary movements of the arms, especially of the right one. There was great weakness of many groups of muscles, and partial weakness of almost all others. When placed in a lying position on the floor patient was unable to get up by herself unless she had a chair or low stool to catch hold of; even then she had great difficulty, taking from half a minute to a minute to complete the operation.

The tongue was protruded easily, and in the middle line. The cervical extensors and spinal extensors were fairly strong. There was great weakness in all the muscles of the arms, and almost complete paralysis of both triceps muscles and the extensors on the back of the right forearm, those of the forefinger being better than those of the little finger. Patient was unable to abduct either arm to a right angle; there was limited supination of the right forearm. She never used her right arm for anything; on being asked to use it to pick up a light article, such as a

match-box, from a table, she proceeded just as if afflicted with chorea and generally failed to pick it up; if she succeeded she generally dropped it a second or two later. When put on a chair she could touch her feet with her right hand, but not without lifting her foot off the ground at the same time. The left arm was also very weak, but she could use her left hand quite well, though choreic-like movements were often seen in it. At meals she used only her left hand. She was quite unable to dress herself, but could fasten a button in front of her dress with both hands, proceeding just as in a case of ordinary chorea, and taking from one to two minutes. She could not put her right arm into hip firm position, and could not keep her arms in neck firm position when they were passively placed so while she was lying down.

There was complete paralysis of the external rotators of both thighs and eversors of both feet; patient could not lie with her heels nearer than 6 inches apart. The glutei maximi were fairly strong. There was considerable weakness of the abductors of the thighs and partial contracture in the adductors of the left side. The extensors of the knees were in good condition, and had suffered least in the general atrophy. There was almost complete paralysis of the flexors of the left foot. The anterior abdominal muscles were weak.

When administering leg rolling, spasticity of the muscles could to some degree be felt. Such spasticity could not be detected in the arms or trunk.

Measurements as follows:—

	Left side.		Right side.
Ankle, minimum just above	15 cm.	...	15 cm.
Calf, maximum	22 ,,	...	23 ,,
Thigh, minimum	25 ,,	...	24¼ ,,
Wrist, minimum just above	11 ,,	...	11 ,,
Forearm, maximum	15½ ,,	...	14½ ,,
Upper arm, minimum just above elbow-joint ...	14 ,,	...	14 ,,
Middle of upper arm	13 ,,	...	13 ,,

Patient's intelligence was good, and her speech normal. She slept fairly well, but talked at intervals of a few minutes during most of the night; sometimes she shouted and made violent movements, which occasionally woke her up. She also woke every time she was going to have a motion. The heart and lungs were normal.

Treatment.

(1) Sitting head exercise, PP.

(2) Forwards lying back exercise, PP.

(3) Half lying foot rolling, PP; peroneal muscle kneading, PP; eversion, PA, inversion, PR; external popliteal and musculo-cutaneous nerve frictions, PP; left foot flexion, PA, extension, PR.

(4) Half lying leg rolling, PP, flexion, PA, extension, AR; leg nerve frictions, PP.

(5) Half lying double leg rotation externally, PA, internally, PR; double leg abduction, PA, adduction, PR.

(6) Half lying double arm rolling, PP, bending and stretching, AR.

(7) Half lying stomach exercise, PP; shaking over the bladder, and sacral nerve frictions, PP.

(8) Sitting left arm exercise, including supination, AR, pronation, PR; hand and finger extension, PA, flexion, PR; elbow extension, PA, flexion, PR, &c.

(9) Sitting right arm muscle kneading, running nerve frictions, &c., PP.

(10) Swim sitting double elbow pressing downwards, PR, upwards, AR.

(11) Heave sitting double forearm extension, AR, flexion, AR.

(12) Patient was made to practise walking round the room for a few minutes.

Progress.—January 15.—Patient already able to walk better.

February 4.—Patient able to walk better, and with feet straight (*i.e.*, parallel to one another), in a room where there was a carpet, although she was unable to do so on bare boards; she did not move her body so much while walking. Extensors of fingers and wrist of right hand better. Sensation in fingers during brachial plexus frictions in the left arm.

February 6.—Sensation in fingers during brachial plexus frictions in the right arm. Abduction of shoulder-joint better; patient able to hold out 1 kilo. at right angles with right arm, but not with the left.

February 10.—Patient able to run a few steps very awkwardly, but then obliged to stop or she would fall.

February 19.—Patient ran round the room four times (about twelve yards each time) in succession.

February 28.—Patient able to pick up a pin off the table with right hand, although still with choreic-like movements. Involuntary movements of arms much less.

March 1 to 7.—Mild attack of scarlet fever (see p. 273), which seemed to have some beneficial effects. After it the incontinence of urine entirely ceased; the eversors of the right foot and extensors of the right hand were stronger, and patient began to use the latter when eating.

March 10.—Patient, when placed on the ground, able to get up without help and able, when standing, to lift things off the ground, although she did both awkwardly.

March 24.—Walk still improving; patient able to turn her feet out a little while walking. She lifted a cane chair off the ground, using both hands. Arms stronger. Concentric contraction in the eversors of both feet.

March 28.—Patient walked thirty times round the room (twelve yards each time) without stopping. Up to the present she had been wheeled in a mail-cart from where she lived to my villa (distance about 200 yards), but on this day she walked home with help.

April 12.—Patient walked to and from her place of treatment without any help for the first time.

April 24.—Patient walked with her feet turned outwards. Was able to lift a piece of fine wire off a table with her left hand. Involuntary movements of arms almost gone. Right patellar reflex normal, other reflexes about the same. Bladder quite well since March 8; still about 6 motions every twenty-four hours.

Treatment changed on April 27, 1902, as follows:—

(1) Sitting head exercise, PP.

(2) Forward lying back exercise, PP; leg flexion, PP, raising, AR.

(3) Half lying foot rolling, &c., as before.

(4) Crook half lying double knee abduction, AR, adduction, PR, leg nerve frictions, PP.

(5) Sitting arm exercise, as before.

(6) Half lying stomach exercise, PP, shaking over the bladder, sacral nerve frictions, PP.

(7) Reach grasp step standing knee flexion and extension, PA.

(8) Stretch grasp standing drawing forwards, PP, spinal nerve frictions PP.

(9) Ride sitting alternate rotation, AR, ringing, PP.

(10) Practising to walk.

The treatment had to be stopped on May 7, 1902.

Examination.—May 7, 1902.—Patient was able to walk much better, and without assistance, at about the rate of an ordinary person (*i.e.*, about three miles an hour). She turned out her feet while doing so, and was able to keep her arms hanging downwards against her sides. She could run about seventy-five yards without stopping, although this was done awkwardly. There was less inversion of the feet, and less internal rotation of the thighs. While sitting at ease the toes were kept together and the heels two inches apart. When her feet were placed as in the standing position patient could balance herself quite well.

Sensory phenomena.—Less itching, no pins and needles sensation. No diminution of sensation or wrong reference of touch. Sensation felt down the spine during cervical nerve frictions; sometimes in the hand, and always in the upper arm during brachial plexus frictions; and in the lower leg, although never in the foot, during internal popliteal nerve frictions. The pupils reacted very slightly to accommodation, and normally to light. Hearing: Right ear, $\frac{24}{50}$, left ear, $\frac{36}{50}$.

Reflexes.—Micturition: normal, no more incontinence. Defæcation: three motions a day, but none during the night. When patient felt like having a motion she was able to restrain it for as much as half an hour.

Skin reflexes absent. Other reflexes as follows:—

	Left Side.		Right Side.
Kellgren's plantar sign	slight	...	slight
Kellgren's crossed plantar sign ...	no	...	no
Tendo Achillis jerk	no	...	no
Ankle clonus...	no	...	no
Patellar jerk...	less exaggerated than before	...	less exaggerated than before
Knee clonus	no	...	no
Adductor magnus jerk	no	...	no
Tendon reflexes in arms	no	...	no

Motor functions.—Patient much less restless; very few involuntary movements of the right arm; hardly any of the left. Patient able to get up by herself without the aid of a chair, &c.,

when placed in a lying position on the floor. Muscles as a whole stronger. Patient able to perform right forearm supination, AR; able to pick up a needle at once with her right hand. When standing, able to bend forwards and touch her foot with her hand. Both hands used when eating. Patient able to partially dress herself, and when asked to fasten a button in front able to do so, exhibiting very few choreic movements, and taking five to ten seconds to accomplish the process. Patient able to keep her arms in hips firm and neck firm positions when standing up. Eversors of both feet, flexors of left foot, external rotators and abductors of both thighs stronger.

No spasticity of the leg muscles. Measurements as follows:—

	Left Side.		Right Side.
Ankle, minimum just above...	16½ cm.	...	16 cm.
Calf, maximum	24½ ,,	...	25½ ,,
Thigh, minimum	27 ,,	...	26 ,,
Wrist, minimum just above	11¾ ,,	...	11¾ ,,
Forearm, maximum	17 ,,	...	17¼ ,,
Upper arm, minimum just above elbow-joint ...	14¾ ,,	...	15 ,,
Middle of upper arm	14¼ ,,	...	15 ,,

Intelligence better, general aspect of face more lively. Sleep unchanged.

Sequelæ of Meningitis (Syphilitic).

O. S., male, aged 32, came under the manual treatment on July 8, 1902.

History of present illness.—Patient's occupation was that of worker in a brass foundry. Patient's father was ignorant of the nature of syphilis, but stated that from December, 1899, until February, 1900, his son seemed ill and weak, and had a number of large ulcers over his scalp and face, some of which were arranged in a kind of ring round the head; they emitted a foul-smelling discharge. During the same period there were likewise ulcers on the mouth and tongue, and the patient was hoarse; his breath smelt very foul. Patient's father had never noticed any sore on the penis or any rash. About February, 1900, patient began to complain of severe headache, which was worse during the evening. On February 13, the headache was very bad and accompanied by throbbing feelings

in the head, the pain causing patient to walk about holding his head between his hands. During the following day he was worse, but tried to work; he was, however, compelled to go home. During February 16 he was so bad that he consulted a medical man, who gave him a prescription. While waiting at the chemist's to have it made up, patient suddenly felt very ill and lost consciousness. After a few seconds he came to and went through what looked very like an epileptic fit, although he was conscious meanwhile and did not fall into a stupor at its close. After it was over he was taken to a friend's house and soon became semi-unconscious and feverish, and had retraction of the head. During the same evening violent convulsions came on, lasting one and a half hours. A medical man was called in and diagnosed meningitis, stating that the temperature was 40° C. (104° F.); pot. iod. was prescribed. During the night a second attack of convulsions came on, lasting two and a half hours. After this patient was almost completely unconscious for a week; but subsequently he recovered slowly, and by about March 24 was so much better that he was allowed to return home. He was, however, by no means well at this date; he seemed weak, apathetic, dull of understanding and slow in his movements.

Since that time (March, 1900) he had slowly become worse. Soon he only spoke when addressed, his reply being in a slow monotonous thick voice; as time went on he could only be persuaded to speak with great difficulty, answering in whispers. After July, 1900, he ceased to speak, but still used to write in order to express any wish; after a year he never wrote unless asked to do so, and at last, after November, 1901, he could not even be induced to write. During this time he gradually became slower in his movements, and his face assumed a look of deep depression. Treatment by medicine and baths did not have the least effect.

Examination.—July 8, 1902.—Patient walked slowly with his head bent forwards and his eyes looking downwards, with an expression of intense melancholia. His face was flushed and the sterno-mastoids could be seen to stand out prominently. He was round shouldered and his chest was sunk in. He never spoke, smiled, or uttered any sound whatever. He was subject to continual twitching movements of the nose and mouth; and the mouth was generally shaped as if pouting. He understood when

spoken to in a low voice, but executed orders to move, &c., very slowly. When told to sit down he would do so, and remain immovable for hours until told to get up and walk, whereupon he would again comply and slowly walk up and down until told to stop. There was a partially cataleptic state; patient would keep his arms or legs in any position in which they were placed, however uncomfortable, for several minutes.

Sensory phenomena.—There appeared to be complete absence of sensation; patient would let wasps sting him and exhibit no sign. Patient's father informed me that this condition had existed for ten months past at the very least; about nine months ago a medical man who was consulted tried the effect of a very strong electric current, but failed to elicit any sign. Sticking a pin into the patient's legs, arms, abdomen and face, and executing the strongest possible nerve frictions stimultaneously on both internal plantar nerves, both median nerves in the hands, cervical nerves on both sides, and the umbilicus, seemed to produce no impression whatever.

The eyes, as mentioned already, always looked downwards, and patient did not move them upwards or sideways when told to do so. Patient could apparently see quite well, and got out of the way of chairs, &c., and he soon learnt to take up the proper initial position for his exercises. The pupils were somewhat dilated, and reacted normally to light; the ophthalmoscopic examination was negative. The hearing was apparently normal.

Motor functions.—There was general weakness of all the muscles. Patient walked slowly, and only his left arm swung meanwhile; he preferred using the left arm in preference to the right. He could lift up a chair and move it from one place to another when told to do so.

In spite of the fact that sensation appeared to be wanting, patient's walk was normal excepting for slowness. He could walk to and from his house to mine every day; the distance was about five miles and took him four hours. He declined, however, to walk all this at a stretch; every mile or so he would stop for fifteen minutes, and could not be made to go on without a great deal of persuasion. He walked continually at precisely the same rate, and did not change even when told to walk more quickly. He showed no ataxic symptoms while executing his exercises.

There was great stiffness of the muscles of the neck. Patient

could not be induced to move his head either upwards, downwards, or sideways; the sterno-mastoids were hard and contracted, and the head could hardly be extended backwards on the cervical vertebræ in consequence. His food had to be cut up for him, as he was unable to use a knife and fork. When eating he opened his jaws very little, and masticated very slowly; he had to be told every few minutes to take another mouthful, or he would stop altogether. The masseter muscles were hard and contracted. Patient could not be induced to protrude his tongue. He could neither be persuaded to make the least effort at shaking hands nor to grasp a pen when placed between his fingers. After a fortnight's treatment, however, he was able to execute his active gymnastic exercises quite well.

The abdominal muscles were contracted. Both arm and leg muscles exhibited spasticity during passive movements at their joints.

Reflexes.—Swallowing proceeded slowly. Defæcation: Patient was given castor oil each night, and during the next morning was told to go to the closet, which he sometimes did; but on other occasions he did not move, nor go of his own accord later on. A great deal of straining was needed to effect a motion, and what passed was in small, round, hard lumps. Micturition was normal, but the urine was thick and darker coloured than normal. He never passed urine or fæces into his clothes. Patient's father ran short of medicine six days before coming to see me, and his son had not had a motion during the week preceding the first application of the manual treatment.

Other reflexes:—

	Right.	Left.
Plautar reflex	no	no
Kellgren's plantar sign	no	no
Cremasteric reflex	no	no
Abdominal reflex	yes	yes
Epigastric reflex	yes	yes
Tendo Achillis jerk	yes	yes
Ankle clonus	3 or 4 jerks	5 or 6 jerks
Patellar jerk	exaggerated	exaggerated, although not quite so much as on the right side
Knee clonus	no	no
Adductor jerk	no	no
Gluteal reflex	no	no
Tendon jerks in arm	no	no

Patient's sleep was quite good. There was no trophic disturbance beyond some wasting of the muscles. There were no ulcers anywhere.

Patient's appetite was poor. He vomited every day; every now and then this would get worse for a period of about two weeks, during which he would vomit after every meal. The lungs and heart were healthy. The pulse, after patient had sat still for twenty minutes, was 60 per minute. There was no arterio-sclerosis.

Treatment.

(1) Sitting head exercise, including fronto-nasal running vibration, PP, bitemporal movement, PP, head rotation externally, PP, internally PR; head extension backwards, AR, flexion forwards, PR; jaw opening, AR; closing, PR.

(2) Reach grasp standing head flexion, PR, extension, AR, cervical nerve frictions, PP.

(3) Reach grasp stoop fall standing double elbow flexion and extension, PA, executed with shoulder hacking, PP.

(4) Forwards lying back exercise, PP.

(5) Ride sitting alternate rotation, AR, ringing, PP.

(6) Heave lean standing chest expansion, PA.

(7) Heave grasp standing chest clapping, side shaking, PP.

(8) Stretch stride standing bending forwards, PA.

(9) Stretch grasp standing drawing forwards, PP, subcostal shaking, PP, abdominal intercostal nerve frictions, PP.

(10) Half lying double leg rolling, PP, flexion, PA, extension, AR; leg nerve frictions, PP.

(11) Half lying stomach exercise, subdiaphragmatic suction, PP, practising deep respiration, PA; prostate gland frictions, PP.

In addition, patient sometimes received frictions simultaneously on both internal plantar nerves, both median nerves at the base of the thumb, the anterior branches of the cervical nerves on both sides, and the umbilicus. The use of laxatives was prohibited.

Progress.—July 14.—Patient did what he was told to do more quickly than before, and also moved more quickly from to-day onwards. After his head exercise his mouth seemed full of thick mucus, but he could not be persuaded to spit it out, and would not allow it to be removed by a handkerchief.

July 25 to August 4.—Treatment interrupted.

August 10.—Patient's intelligence slowly improving. No vomiting. Appetite normal. Motion every other day.

September 13.—I had tried at intervals during the last month to make patient write his name, but did not succeed until this day. After very much persuasion on my part he wrote it, and after being ordered continually for about five minutes to pronounce it, he managed to do so in a whisper.

September 15.—After being asked to write "yes" or "no" as to whether he felt better, patient wrote down (in Swedish): "I am better now," signing his name after the answer. He required much less persuasion than on the previous day, and, after being ordered continually for about five minutes, was able in a whisper to repeat what he had written. During the evening of the same day his father asked him to write down why he did not speak. He wrote (in Swedish): "Of course it is because of the cramp."

September 16.—Patient at length understood and carried out the order to spit out into a test tube the thick mucus from his mouth that collected after head exercise. The discharge was foul-smelling, very thick, and yellowish in colour. It did not either this day or at any subsequent date give the cerebro-spinal fluid reaction with Fehling's solution or acetic acid (see p. 186).

September 19.—Patient read aloud a paragraph of a newspaper after a good deal of persuasion before and during the performance.

Patient finished treatment on September 27, 1902. Owing to my temporary absence I did not see him until October 6.

Examination.—General condition much improved. He could stand and walk straighter. He could look up at the ceiling so that the central line of vision formed an angle of 45° with the ground. His expression was more intelligent. He would get up, walk about, and sit down again by himself. No cataleptic symptoms were left. The face was less flushed, the sterno-mastoids not so prominent. Patient sometimes talked in a low voice spontaneously, and generally answered when spoken to.

Sensory phenomena.—Patient could feel stimuli, such as a light tap, on hands and feet; if asked beforehand to say "now" when feeling it, he did so, the interval elapsing before his doing so varying from one to four seconds. He could feel a pin-prick on the legs, arms, and trunk, but not a light tap. His face contracted

as if from pain during hard nerve frictions on different parts of the body, and on being asked whether the manipulation hurt, he answered "Yes."

The pupils were less dilated, and reacted normally to light.

Motor functions.—All his muscles were stronger. Patient could walk more quickly; he walked from his home to the place of treatment in two and a half hours. He was able to move his head fairly freely. He could sometimes be induced to cut up his own food with a knife and fork. He masticated more quickly, and did not need to be reminded to go on eating. The sterno-mastoids and masseters were less contracted. The tongue could be protruded, although tremulously. Patient shook hands when told to do so. He had of late been writing a few letters, and during this morning, quite spontaneously, wrote a letter of four pages to a friend. The handwriting was quite clear, the sentences quite well framed and with correct punctuation.

Reflexes.—Swallowing slightly better. Defæcation: motion every day.

Other reflexes :—

	Right.	Left.
Plantar reflex	no	no
Kellgren's plantar sign	no	no
Cremasteric reflex	no	no
Abdominal reflex	yes	yes
Epigastric reflex	yes	yes
Tendo Achillis jerk	no	yes
Ankle clonus	no	no
Patellar jerk	exaggerated	marked
Knee clonus	no	no
Adductor jerk	no	no
Gluteal reflex	no	no
Tendon jerks in arm	no	no

Patient's intelligence had improved; occasionally he laughed.

Patient's appetite was better, and he was no longer troubled with vomiting. The pulse, after he had sat still for ten minutes, was 72 per minute.

Bulbar Paralysis.

Mrs. H., aged 52, came under the manual treatment on March 6, 1899.

History of present illness.—About March, 1897, she found that speech was a little difficult. It gradually became more so, and then regurgitation of the food into the nose occurred. No cause could be assigned. Patient had however, become very

weak and of low vitality about two and a half years previously in consequence of the death of one of the members of her family. Medical aid was not sought for some time, but as the symptoms become progressively worse, speech and swallowing becoming more and more difficult, a medical man was consulted, who diagnosed bulbar paralysis. This diagnosis was subsequently confirmed by several other medical men. During May, 1898, patient was told that her condition was hopeless, and that no improvement could be expected from any remedy whatsoever. From then until March, 1899, she had been trying massage, baths, &c., but all to no purpose; nothing seemed to effect the slightest amelioration.

On March 6 I was called in.

Examination.—The condition was well advanced. The face was mask-like and expressionless; the mouth was half open, and saliva ran from it continually. There was complete facial paralysis on both sides; the lips could not be moved; the lower lip hung down. The tongue was nearly paralysed, only slight movements forwards and backwards being possible. Speech was almost impossible; a few words like "Mamma" could be pronounced with great difficulty, but otherwise patient could only utter a few disarticulate sounds and grunts. Patient could not swallow the saliva unless very much accumulated in the back of her mouth. Only liquid food (eggs beaten up in milk) had been taken for some months past, patient not daring to try and swallow anything solid or semi-solid.

There were no fibrillary tremors of the face, but there were some of the tongue.

The general condition of the patient was one of considerable weakness. The arms were more affected than the legs; any communication the patient had to make was written by her. She was only able to write slowly and with tremors in the arm, so that what she did write could only be read with difficulty.

Treatment.

(1) Sitting head exercise, PP, including strong vibration over the medulla; larynx and trachea shaking; frictions on the facial, superior and inferior laryngeal, lingual, hypoglossal, and glossopharyngeal nerves, PP.

(2) Reach grasp standing head flexion, PR, extension, AR, cervical nerve frictions, PP.

(3) Forwards lying back exercise, PP.

(4) Sitting arm exercise, PP, AR, &c.

(5) Heave grasp standing chest clapping, PP, side shaking, PP.

(6) Half lying leg rolling, PP, flexion, AR, extension, AR; leg nerve frictions, PP.

(7) Half lying stomach exercise, PP.

(8) Walk standing double arm circling, breathing, PA.

March 22.—Some tremors were felt below the eyes.

March 29.—Some movement of the facial muscles had returned. Patient could swallow a little better, and the word "Mamma" could be pronounced a little more clearly.

April 10.—Some tremors in the soft palate were felt. All the muscles of the face which formerly were quite paralysed were able to move again, although not yet to their normal extent.

April 20.—Movement in the soft palate commenced, and was visible. The food no longer regurgitated through the nose. The facial muscles were nearly normal in their movements, and the speech was slightly better.

May 23.—The treatment had to be interrupted until July 1. The improvement was still being maintained, although slowly. The soft palate moved better, the voice was better, and tremors had begun in the larynx. The swallowing was a little easier, and the saliva came in far less quantity. The general condition was stronger.

July 1.—Patient's condition had declined a little since May 23, and her speech had become worse again. The facial muscles, however, had not lost their tone or any of their power.

August 30.—Patient's condition since July 1 had undergone hardly any perceptible change; if anything a very slight improvement had taken place, as the amount of saliva had gradually diminished during the last month. The relatives of the patient did not wish her to continue the treatment, as they thought it could not do her any good. Against my advice, and also that of my colleague, Dr. A. Möller, she went home.

I heard during the course of the next six months that a change for the worse had set in, and that after she left my hands the course of the disease was steadily downhill. Patient

continued to become worse, and her food had to be administered by means of a tube; during May, 1900, she died from involvement of the respiratory centres.

Disseminated Cerebro-Spinal Sclerosis.

K. J., aged 27, occupation tailor, came under the manual treatment on July 1, 1899.

History of present illness.—Patient denied syphilis. He said that he had been somewhat nervous all his life, but not to such a degree as to prevent his going through compulsory military service some years previously. He definitely attributed his illness as the result of a fall off a bicycle in May, 1896; in consequence of his machine slipping he was thrown off, and he remembered receiving a severe blow, which caused him great pain in the head and left side, and was followed by loss of consciousness. After a few minutes he regained his senses, but felt very queer. The accident happened quite close to his home, and he walked home the rest of the way (about 100 yards). He felt very shaken and queer for an hour on arriving home, but then felt better again. He did not, however, altogether recover, and found when trying to bicycle again that he was shaky, had difficulty in keeping his balance, and had to ride in the middle of the road; if he approached the side where the ditch was he had to stop, or would have ridden into it. He likewise found that he had difficulty in walking. He could not walk as quickly as before, neither could he bicycle at more than half his usual speed.

His strength gradually left him, and in the left leg pain began to be felt; this became worse and worse, and he walked with still more difficulty, leaning over to the left side. Early in 1897 he found difficulty in keeping his balance when walking in the dark. Early in 1898 he noticed that his legs began to shake when engaged in any movement requiring exertion, and later on his left arm began to do the same. By August, 1898, these tremors appeared during such ordinary movements as walking, and they had also begun in his right arm and head.

About Christmas, 1898, patient began to experience waves of heat passing through his body; these were specially marked in his toes and hands. After three weeks of this, waves of cold

sensation came on and in time replaced the waves of heat. His general condition steadily became worse, and he said he had an attack of influenza in March, 1899, which made him very much worse in a few days. So far he had been able to do a good deal of work (although nothing very fine), but now he had to stop. Great pain appeared in the legs, and he shook very much when walking or moving his legs.

In April, 1899, he sought advice for the first time;[1] his medical man recommended electricity, and he was treated daily with it for seven weeks, from the beginning of April to the end of May. This, however, made him still worse. At the end of the time his physician told him that he had spinal cord disease and was incurable. Patient then went to Dr. Engstrand, (the head medical man in Jönköping), who diagnosed disseminated cerebro-spinal sclerosis, and told patient that his only chance was to try the manual treatment.

Examination.—July 1, 1899 (by Dr. A. Möller and myself).—Patient walked with great difficulty, and was unable to get along without the help of a stick. He kept his feet wide apart, the lines described by his heels being about one and a half to two feet apart, his knees quite straight and his trunk forwards, with his eyes fixed on the ground. He often reached with the other hand (the one not holding the stick) for support from chairs, tables, &c. When walking marked volitional jerks could be seen in his head, both arms, and both legs. His speech was slow, monotonous and syllabic ; his face moved but little when he spoke.

Sensory functions.—Patient complained of a general feeling of cold, which occasionally seemed to pass over him in waves. A feeling of cotton wool under his feet had been present since May, 1899. He did not suffer greatly from pain ; when present it was located to a region in the lower limbs corresponding to the external cutaneous nerves. There was continual headache. The muscular sense was diminished.

Eye symptoms.— Patient complained that objects continually

[1] The fact that no advice was sought until this date must appear strange to many of my readers. The explanation is, however, that in Sweden in consequence of the small population (about 28 per square mile) and the small number of towns, persons living in the country are sometimes distant thirty miles or more from the nearest medical man, and that communication is frequently only by very bad roads.

seemed to dance in front of him, then there was a pause after which they danced again. Patient had not any great difficulty in reading, although he said that the print danced in front of him. Nystagmus was present. The left eye reacted less to light than the right one. The reaction to accommodation was fairly good.

Hearing, taste and smell were normal as far as could be judged.

Motor functions.—Reflexes.—Swallowing was normal. Micturition: there was difficulty in starting the stream, and patient sometimes had to try five minutes before he could get it to start, and at first it came in drops. There was also some difficulty in keeping the urine; this was first noticed after the electricity treatment. Defæcation: there was a motion generally every two days, although occasionally three days elapsed, and there was difficulty in getting it to start. There was no ankle or knee clonus on either side; patellar, cremasteric and abdominal reflexes were slightly present on the right side. None of these reflexes were present on the left side.

Voluntary movements.—The walk has been described. All voluntary movements were accompanied by volitional jerks, which absolutely ceased when the former ceased, and which became intensified during duplicate movements. Patient could eat with a knife and fork until April, but then gave up doing so as, in consequence of the volition jerks, he was unable to cut his food and unable to convey it to his mouth. He now ate with a spoon, and could only use his left hand in doing so. He could hardly sew at all with his left hand, as the fingers moved over one another in a rubbing kind of way when he tried; he could not even hold a needle in his right hand. On being asked to protrude the tongue, he did so with jerks of that organ, and it exhibited fibrillary twitchings, especially round the edges.

Coördination.—The Romberg symptom was present, the patient swaying for a few seconds first. With the eyes kept open he swayed a good deal, but did not fall. He could not walk in a straight line, but deviated considerably. With his eyes closed he could not bring his finger tips together. He wrote with his left hand with difficulty.

Patient's memory was not so good as it used to be. He was very thin, weighing 59 kilos. in ordinary clothes.

There was a C-shaped scoliosis with the convexity to the right, and the right shoulder was higher than the left.

The sexual power had been weak for a year or more, and since April, 1899, it had been quite lost; no erection ever took place any more.

Treatment.

(1) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(2) Stretch grasp standing drawing forwards, PP, vibrations over the bladder, PP.

(3) Loin lean stride standing alternate rotation, AR, ringing, PP.

(4) Forwards lying back exercise, PP.

(5) Stretch side lying running nerve frictions, PP, leg lifting, AR, pressing down, PR.

(6) Heave grasp standing chest clapping, PP, side shaking, PP.

(7) Stretch stride standing bending forwards, PA.

(8) Stride sit kneeling raising, AR.

(9) Standing vertebral column stretching with AR at the patient's head.

(10) Half lying stomach exercise, PP.

On September 30, 1899, patient left, saying that he would come back in three days; he did not, however, do so until December 13, and in consequence no systematic examination was made. Patient, however, told me afterwards that he improved during the time of treatment; he could walk more easily and did not need to use his stick so much; he could even walk a few yards without it. He said that the jerks on voluntary movement were less in amount.

On December 13 the patient returned to continue the treatment. He was in every respect worse than when he left on September 30. Owing to temporary illness on my part I could not make the examination until January, 1900. During that time, however, the treatment was administered by my colleague, Dr. A. Möller. Patient was already better than on December 13. He said that three days after leaving off the manual treatment in September, he began to feel worse, walk worse, &c.; he got steadily worse until December 13; his condition then remained stationary for two days, and then he felt better again. From December 24 to 26 he received no treatment, and on the 26th

he felt that he was again getting worse. Since then, undergoing the treatment all the time, he had progressed steadily.

Examination.—Patient's walk was much worse than in September; he had great difficulty in walking at all, even with the help of a person on one side holding him up, and the use of a stick in the other hand. He was lodging at a house about 200 yards from my own, and to walk that distance took at least ten minutes. In case of windy weather, patient had frequently to stop or he would be blown over, so bad was his ability to balance. He walked with his knees straight and his feet wide apart, hardly lifting his heels at all; his arms were spread out and caught hold of doors, tables, chairs, &c., to assist his balance, and his whole body exhibited marked volitional jerks in trunk, limbs, and head. Patient's speech was still slower, more monotonous and monosyllabic, and the corners of the mouth twitched while he talked.

Sensory functions.—Patient had been subject to severe lightning pains in his arms and head and lower limbs, specially the latter. He had continual headaches, which were so bad during December before he came to be treated that he could hardly see at all. There was impaired sensation in the feet; patient continually felt as if he were walking on cotton wool. When receiving forwards lying running nerve frictions he felt as if they were being administered through a blanket which deadened sensation. There was a continued feeling of formication in the upper dorsal region and in the pectoral muscles. The mouth and nose felt numb; there was considerable anæsthesia of the fifth nerve; very little sensation was felt on pinching hard the skin of the face. His feet and legs were always cold. There was no sensation in the feet during popliteal nerve frictions, and none in the spine during cervical nerve frictions. There was considerable diminution in the muscular sense.

Eye symptoms.—Nystagmus was very well marked, and patient said that objects danced more than they used to. The right eye reacted very little to light, and the left not at all; the reaction of both to accommodation was not good. Patient could hardly read at all. There was no achromatopsia. Patient's taste was not so good as it used to be; his hearing and smell were apparently normal.

Motor functions—Reflexes.—Micturition: there was difficulty

in getting the stream to start; patient often tried eight minutes without success, and then he would stop and try again later on. When he did succeed, the stream at first only came in drops. He had partial incontinence sometimes; he always felt it coming on, and then could not hold his water for more than half a minute or so. Defæcation: rectal evacuation took place about every three days, occasionally every four. There was considerable difficulty in getting the motion to start, fifteen minutes having often to be expended in efforts.

No ankle or knee clonus, patellar, abdominal, or cremasteric reflexes could be obtained on either side.

Voluntary movements.—The volition jerks were much more marked. The gait has been referred to. During ride sitting trunk flexion, PR, extension AR, patient jerked very much indeed; his head made a series of jerks forwards six inches and backwards three, and his gluteal region was lifted off the couch each time from three to six inches. About half-way through the first part of the exercise patient lost his balance altogether and had to put out his hands to catch hold of the couch to support himself. Patient had to be supported while trying to perform stretch stride standing, bending forwards, PA. Movements involving flexion of the knee-joints could hardly be done at all. An attempt to perform reach grasp toe standing double knee bending, PA, resulted in the patient falling almost at once. During all movements of resistance the whole body jerked very much.

Patient used to feed himself with his left hand with a spoon, and had to bend his head forward to get the spoon into his mouth. If he did not the jerks of the left hand were so great that he could not bring his spoon up to his mouth. Even when bending his head forwards the contents of the spoon were often spilt. Patient could not sew at all, and when trying to cut out the scissors wobbled about so that he cut all wrong. He had great difficulty in writing, as he could hardly hold a pen, due to volitional jerks in his fingers.

Coördination.—With eyes shut and feet together he would fall at once; with eyes open and feet together he would sway for a second or so and then fall.

Patient was very thin and his joints were very supple. When sitting on the floor with his knee-joints fully extended, patient

could bend his body forwards so that his mouth touched his knees. His memory was worse than during July. His speech has been described. He had slept very badly during November, but since then satisfactorily. There were no volition jerks when trying to go to sleep, though when sitting still the head nodded to and fro continually.

The scoliosis was better and the shoulders were of the same height.

The pulse while patient was sitting down was 52 per minute.

The treatment was about the same as before, with the addition of sitting head exercise, PP, and ride sitting trunk flexion, PR, extension, AR.

Progress.—February 13, 1900.—Volition jerks not so marked. Patient walked up a flight of fifteen steps in my house, holding on to the bannister on both sides; it was difficult for him to do so, but his efforts were successful. He said that he could not have done this two months previously. The walk was better. Sensation was present in the feet during popliteal nerve frictions.

March 13.—With feet together and eyes shut patient swayed for a few seconds before falling. The volition jerks were slightly less. Patient was able to sew and cut out a little.

April 12.—Patient did not fall at all with his feet together and his eyes shut. There was less difficulty with micturition; a rectal evacuation had taken place almost daily during the last month. Frictions on the cervical nerves caused some slight sensation down the spine. The volition jerks were considerably less.

April 20.—Patient had made very great progress during the last three weeks as regards his walk. On April 18 he moved to Huskvarna, and since then he had walked to and from my house once daily, the distance between his house and mine being about two-thirds of a mile.

Patient during the time he was under treatment had occasionally, every fortnight or so, had a very bad headache, lasting from two to five days. At the conclusion of the headache his improvement was quicker for the next few days. Thus he had a rather bad attack just about April 1 before he made the considerable improvement between that date and April 20.

May 5.—Patient said that he had not walked as well as to-day for the last fifteen months.

May 15.—An attempt, for the first time, to get patient to perform reach grasp toe standing double knee bending, PA, failed; he jerked up and down violently two or three times, and then would have fallen if I had not held him up.

May 24 to 27.—Bad headache.

May 28.—Some fever.

May 29.—Patient said that he was able during the morning to stand alternately on each leg while putting on his trousers; he had not been able to do this since February, 1898.

June 8.—Patient's walk continued to improve. His headaches were less severe; he could to-day perform reach grasp toe standing double knee bending, PA, although it was very jerky.

July 15.—Headaches still better; patient has not felt as well for over two years.

August 10.—Patient's right hand had so far recovered that he was able to use it for sewing purposes to do his tailoring, and while cutting out the scissors did not wobble at all.

September 14.—Patellar reflex on left knee had returned to a slight extent. Cervical nerve frictions could be felt down the whole of the spine quite well, and during the exercise stretch half lying double hand and foot nerve frictions, PP, added about two months previously, sensation was felt through the whole of the body.

The treatment had gradually changed, and was now as follows:

(1) Sitting head exercise, PP.

(2) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(3) Stretch grasp standing drawing forwards, PP, intercostal nerve frictions and vibrations over the bladder, PP.

(4) Head lean arch standing toe raising, breathing, PA.

(5) Forwards lying back exercise, PP.

(6) Ride sitting trunk flexion, PR, extension, AR.

(7) Heave grasp standing chest beating, PP, side shaking, PP.

(8) Stretch half lying double hand and foot nerve frictions, PP.

(9) Side lying running nerve frictions, PP, leg lifting, AR, pressing down, PR.

(10) Half lying stomach exercise, PP.

(11) Stretch stride standing bending forwards, PA.

(12) Reach grasp toe standing double knee bending, PA.

October 20.—Nystagmus only very slight. Patient could walk when the weather was not windy as quickly as any ordinary

person. He did not jerk so much when performing his gymnastic exercises; this was specially noticeable as regards his arms. Two days ago he left off eating with a spoon, and now ate with a knife and fork. The tongue trembled at the edges, but did not jerk when patient protruded it.

November 6.—Objects did not dance in front of patient any more, excepting slightly while reading. There was no nystagmus.

December 3.—Slight knee clonus on left side, none on right. Some ankle clonus on both sides. Patellar reflexes: left normal, right not quite so marked.

Examination.—December 20, 1900.—Patient's walk much better; he walked from his house to mine daily, this taking him fifteen to twenty minutes, the distances being about two-thirds of a mile; even when it blew hard he could get along fairly well. He preferred walking with the aid of a stick, though the latter was by no means a necessity. When walking he bent his knees and lifted his heels off the ground, and placed his feet fairly well in front of one another, the lines described by his heels being about four inches apart. With the help of a stick he could place his feet when walking so as to describe a continuous straight line; he could not, however, do this without a stick. Some slight volitional jerks were visible in his legs while walking, but none in his arms. Patient's speech was quicker and more lively; he raised and dropped his voice, and generally speaking talked like an ordinary person.

Sensory functions.—No lightning pains experienced, but pain was often felt in the ankle-joints, lumbar region, side of abdomen and calves. The headache was much better. For the last three weeks or so great waves of heat had been passing over patient's body, similar to those of 1898, as already mentioned. The feet and legs were now always warm. There was sometimes a feeling of formication in the back of the head and the fingers and heels. The fifth nerve appeared to be normally sensitive. There was no numbness anywhere excepting to a slight extent under the feet, and this was only perceived during nerve frictions on them. The muscular sense was quite good. Sensations in the whole body were felt on receiving stretch half lying double hand and foot nerve frictions, PP, and on receiving cervical nerve frictions, and there was sensation in the feet during sciatic and popliteal nerve frictions. The sensory nerve conductivity in general seemed quite good.

Eye symptoms.—No nystagmus ; patient said that objects did not dance at all in front of him, nor did the lines of a newspaper during reading, unless he was very tired or had a bad headache. The pupils reacted fairly well to accommodation, but little to light. Patient's taste was normal again, but his smell not yet fully restored.

Motor functions. — Reflexes. — Micturition : this was now normal ; there was never any symptom of incontinence or retention ; the stream started at once on making the effort. Defæcation : there was no difficulty in getting the motion started ; there was an evacuation usually every day, occasionally every other day.

No epigastric or abdominal reflexes. Kellgren's plantar sign and ankle clonus (four or five jerks) present in equal amount on both sides. Patellar reflex : left, exaggerated, followed by several jerks at knee-joint and ankle-joint ; right, present but not quite to normal amount. Knee clonus : left, one or two jerks felt ; right, there appeared to be the beginning of a jerk.

Voluntary movements.—While patient was sitting still, the head did not nod at all ; when he walked quickly it did so very slightly. There were no jerks in the arm when patient held it out at right angles ; the fingers remained almost immovable. During a strong duplicate movement a few volitional jerks took place in the arms. During ride sitting trunk flexion, PR, extension, AR, about twenty small jerks were given, each one bringing the patient back about half to one inch ; there was no tendency to fall or lose the balance. Patient could perform stretch stride standing bending forwards, PA, quite well without support. The only movements that caused much jerking were those which entailed contraction of the quadriceps extensor cruris, and the exercise head lean arch standing toe raising, breathing, PA. When patient stretched out his tongue there were no jerks, but fibrillar twitchings along the edge. Patient ate with knife and fork quite well. He could sew with his right hand. He could whistle and smack his lips. When speaking his face moved normally.

Coördination.—Patient could walk fairly well in partial darkness. With eyes shut and feet together he swayed a good deal, but did not fall. With eyes shut and feet at right angles he swayed somewhat. With arms spread out and one foot off the ground he could balance for a second or two without falling.

Patient said that he felt much stronger. He was still very thin, his weight being 61½ kilos. He had been perspiring very

much at night for the last three weeks, ever since he began to experience waves of heat passing over him, as mentioned. His memory had improved during the year.

The spine was straight, and no curvature could be seen.

The pulse while patient was sitting down was 74 per minute.

Erections of the penis often came on; but he had not yet attempted coitus.

Patient continued the treatment under my colleague, Dr. Harry Kellgren. On March 5, 1901, I again saw him. He had continued to improve. The pupils reacted both to light and accommodation, though better to the latter. There were no skin reflexes. Patellar reflex: left, normal; right, less than normal. Ankle clonus, a very little on both sides. A little knee clonus on the left side.

On April 4 Dr. Harry Kellgren wrote to me: "Patient walks better; can run alone about seven or ten steps. He can do—Ride sitting falling backwards, breathing, PA; head lean arch standing toe raising, breathing, PA; stride sit kneeling raising, AR; lying double leg flexion and extension, PA, perfectly steadily, without assistance and without the jerks which he had before. There are no cutaneous reflexes; the knee jerks are the same as on December 20, 1900; there is no ankle clonus. Pupils react to light and accommodation."

Subsequent history.—Treatment interrupted May 7 to June 1, 1901. After that not very much improvement took place; the improvement by January 3, 1902, can be summed up as follows: No cotton wool feeling under the feet. No volitional jerks in head when walking fast. No knee or ankle clonus. Seminal emissions again taking place; about once every three weeks.

On January 3, 1902, patient, without having said a word previously, left off coming to me for treatment, as he had been persuaded to try some new remedy instead. I have not seen him since that date, and therefore have had no opportunity of making any examination as to his condition.

Spinal Apoplexy during Secondary Syphilis.

H. S., aged 51 years, male, came under the manual treatment on January 8, 1900.

History of present illness.—During November, 1881, patient contracted primary syphilis, which was followed about February, 1882, by secondary symptoms—hoarseness, sore throat, ulcers in the mouth, swollen glands in the neck, condyloma at the anus, &c. During April, 1882, while standing still, patient was suddenly seized with pains in his back and twitchings in his limbs; in a few minutes he felt his legs giving way, and he was obliged to lie down. In the course of about half an hour complete paralysis of motion and partial paralysis of sensation ensued in both legs, together with incontinence of both urine and fæces; there was also a sense of constriction round the abdomen. No medical aid could be obtained until eight days had elapsed, when patient had so far recovered that he could walk a little; the medical man consulted told him that his spinal cord was affected. A very slow improvement gradually took place during the ensuing two years. After that, however, his condition remained almost unaltered, in spite of his having taken many different kinds of medicine, and having at intervals tried baths, electricity, and massage.

Examination.—January 8, 1900.—Patient walked awkwardly, with the aid of a stick, and with his knees somewhat bent; and he had a foot-drop which caused him to lift his feet high off the ground at each step ("steppage gait"). While walking he looked continually as if he were on the point of falling forwards.

Sensory phenomena.—Patient complained of lightning pains in the course of both great sciatic nerves, of more or less continued pain in the front of both lower legs and outer side of both thighs, and of a sensation of constriction round the abdomen. There was cotton wool sensation under both feet. There was partial anæsthesia of the feet on both plantar and dorsal aspects, and of the front of both lower legs; in these areas there was delayed conduction of sensation, sometimes as much as three or four seconds elapsing after the application of a pin prick before the sensation was felt. In the abdomen there was hyperæsthesia at the level of the seventh and eighth intercostal nerves, with slight anæsthesia and delayed conduction below this area. There was no sensation in the spine during cervical nerve frictions.

The eyes reacted slightly to light and not at all to accommodation. Both pupils were very small.

Motor phenomena :—Reflexes.—Micturition: there was diffi-

culty in retaining the urine, and nocturnal incontinence was present. Defæcation: There was constipation, often five or six days passing without a motion; patient often had to strain hard for twenty to thirty minutes before he could get one.

Other reflexes were as follows:—

	Right.	Left.
Epigastric skin reflex	slight	slight
Abdominal skin reflex	marked	marked
Babinsky's sign	marked	marked
Kellgren's plantar sign	yes	yes
Tendo Achillis jerk	yes	yes
Ankle clonus	10-20 jerks	20-30 jerks
Patellar reflex	exaggerated	much exaggerated
Knee clonus	5-6 jerks	5-10 jerks
Adductor jerk	yes	yes
Crossed adductor jerk	yes	yes
Semimembranosus jerk	yes	yes
Semitendinosus jerk	yes	yes

There was general weakness of all the muscles of the lower limbs; this was especially marked in the anterior tibial muscles, patient being unable to flex his foot to a right angle, and in the abductors of the thighs patient being almost unable when in side lying position to abduct his leg.

Patient could not correctly locate the position of his feet. With feet together and eyes shut, also with heels together but feet at right angles and eyes shut, patient fell at once. Patient could not walk in a straight line. He was quite unable to stand on one leg, even when balancing himself with his arms. He suffered from occasional attacks of prolonged twitching and spasms in his legs. Sensation and motion in the arms were unaffected.

Sexual functions.—Since the onset of his illness patient had never had an erection or nocturnal seminal emission. There was atrophy of both testicles, this being especially marked in the case of the left one, which was hardly three-quarters of an inch in its long diameter. Testicular sensation was lost.

A certain amount of chronic bronchitis had been present ever since the onset of the disease. The lower intercostal spaces were indrawn on inspiration.

Treatment.

The exercises were changed a little from time to time, but the following is a general specification:—

(1) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(2) Stretch grasp standing drawing forwards, PP, frictions on the abdominal intercostal nerves, and shaking over the bladder, PP.

(3) Ride sitting trunk flexion, PR, extension, AR.

(4) Forwards lying back exercise, PP, leg flexion, PR, raising, AR.

(5) Heave grasp standing chest clapping, PP, side shaking, PP.

(6) Stretch stride standing bending forwards, PA.

(7) Sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(8) Side lying leg lifting, AR, pressing down, PR, leg nerve frictions and side length hacking, PP.

(9) Loin lean stride standing alternate rotation, AR, ringing, PP.

(10) Head lean arch standing toe raising, breathing, PA.

(11) Half lying stomach exercise, prostate gland frictions, PP.

Progress.—March 19.—Patient stronger, especially in the abductors of the thighs; he walked more easily. With feet together and eyes shut he swayed a good deal, but did not fall. There was less difficulty in retaining the urine. There was no nocturnal incontinence, although patient was obliged to get up two or three times every night to pass water. Rectal evacuation took place every second or third day.

May 8.—Sensation and conductivity were normal over the front of the lower leg and dorsum of foot, and there was very little sensation of cotton wool under the feet. The Romberg symptom was almost gone; patient swayed but little more than a normal subject. He was able to-day, for the first time for eighteen years, to stand alternately on each leg while putting on his trousers.

July 7.—Patient steadily gaining strength. Cervical nerve frictions felt down the spine as far as the sacrum. Fewer lightning pains.

September 8, 1900.—Treatment finished.

Examination.—Patient's walk better, although still, but to a less extent, exhibiting the peculiarities mentioned on p. 434.

Sensory phenomena.—Fewer lightning pains, and less pain in

the feet and lower legs. No anæsthesia or delayed conduction anywhere. Sensation of constriction round the abdomen not so pronounced; less hyperæsthesia in the area of the seventh and eighth intercostal nerves. Patient able to locate the position of his feet. No Romberg symptom (see below).

The right eye reacted fairly well to light, but the left eye hardly at all. Both eyes reacted slightly to accommodation. When doing so the left pupil dilated somewhat irregularly. Both pupils were larger than when patient first came to me.

Motor phenomena.—Reflexes.—Micturition: this was normal, except for a slight difficulty in retaining the urine. Defæcation: a motion took place every day or every other day, and little straining was needed in order to effect it.

The other reflexes were as follows:—

	Right.	Left.
Epigastric skin reflex	slight	slight
Abdominal skin reflex	yes	yes
Babinsky's sign	yes	yes
Kellgren's plantar sign	no	no
Tendo Achillis jerk	no	no
Ankle clonus	5-10 jerks	10-20 jerks
Patellar reflex	normal	exaggerated
Knee clonus	1 or 2 jerks	1 or 2 jerks
Adductor jerk	yes	yes
Crossed adductor jerk	no	no
Semimembranosus jerk	yes	yes
Semitendinosus jerk	yes	yes

The anterior tibial muscles and abductors of thighs were stronger.

Patient could walk in a straight line. With his arms in stretch position he could balance himself on one leg for eight seconds, and he could even do so for two or three seconds with his eyes shut. There had been no attacks of twitchings or spasm for the last three months.

Sexual functions.—These showed very little improvement. No nocturnal emissions occurred; occasionally a slight amount of erection took place.

The chronic bronchitis had almost completely disappeared.

Infantile Paralysis.

In twelve out of fifteen cases of this disease in the chronic stage I found that there was distinct tenderness or even pain

during frictions over the kidneys from behind or over the renal plexus in front; and almost always there was a greater tenderness over the kidney on that side where the paralysis was greater.

Case 1.

G. L., male, aged 15½ years, came under the manual treatment on October 3, 1899.

History of present illness.—During October, 1888, patient was one day attacked with shivering and fever, and about a day later complete loss of motion in both legs resulted, sensation, however, being unimpaired. After three weeks the right leg gradually recovered and became quite well, but the left one made scarcely any progress. No medical aid had ever been sought.

Examination.—Patient was a small-sized subject. He walked with two crutches, using only his right leg; his left leg hung limp and loose, and was two inches shorter than the other. The muscles of the whole left leg, from the gluteal region to the toes, were very much atrophied, as were also the muscles of the left side of the back from the ninth dorsal vertebra downwards.

Voluntary movements of left leg.—Hip-joint: flexion, very weak; extension, hardly any; abduction, none; adduction, slight; external rotation, none; internal rotation, none.

Knee-joint: flexion, very slight; extension, none, the quadriceps femoris for two inches above the knee-joint was a mere fibrous band.

Ankle-joint: flexion, a trace; extension, a trace.

The abdominal and spinal muscles were very weak. There were no reflexes in the left leg. Sensation was quite good in the paralysed area.

There was considerable tenderness over the bladder and left kidney.

Treatment.

(1) Sitting head exercise, PP.

(2) Half lying left leg rolling, PP. muscle-kneading, PP, nerve frictions, PP.

(3) Half lying left leg flexion and extension, PA.

(4) Half lying left foot rolling, PP, flexion and extension, PA.

(5) Forwards lying back exercise, PP.

(6) Sitting trunk extension and flexion, PA.

(7) Sit lying left knee extension and flexion, PP, extension, PA, flexion, PR.

(8) Reach grasp toe standing double knee bending, PA.

(9) Reach grasp step standing left knee flexion and extension, PA, left sciatic nerve frictions, PP.

(10) Stretch stride standing bending forwards, PA.

(11) Half lying stomach exercise, PP.

In the above prescription PA could not always be strictly adhered to, and in most cases the movements had at first to be given with assistance, in some even PP.

Progress.—October 6.—In sit lying position patient could swing his leg to and fro a little, the maximum distance through which the swinging took place being two inches. He said that his back was stronger.

October 8.—Patient's foot could be actively flexed and extended, the toes passing through about one and a half inches of space (maximum).

October 25. — Patient's leg was stronger than before; the atrophy as a whole was less. The quadriceps was larger, and much thicker over the lower third of the femur.

October 31. — Patient could use his quadriceps to such an extent that he could maintain his lower leg, when in sit lying position, so that the heel was about three inches from the perpendicular.

November 2.—Patient said that his back was still stronger.

November 13.—Patient's calf muscles had developed proportionately more than his anterior tibial muscles. He could perform foot extension, AR, although it was impossible to perform flexion with even very slight resistance.

November 17. — Patient no longer needed support during exercise (6) for the extension, but required a little for the flexion.

November 22. — Patient performed exercise (6) without assistance.

December 20. — Treatment finished for the time being. Patient stronger.

Treatment resumed on February 15, 1900. Condition: Patient was stronger in his back than when he left; his leg had also improved slightly. The quadriceps femoris had in-

creased in size. Patient could resist while extension at the ankle was carried out; could also manage half lying leg flexion, PA, extension, PA; exercise (6) could be accomplished without assistance.

March 20.—Patient could overcome a little resistance during foot flexion, AR, and could resist more during foot extension, PR.

April 13 to 16.—No treatment.

April 17.—Left foot slowly getting stronger.

April 23.—Treatment suspended until May 7.

May 7.—Treatment resumed. Prescription changed to the following:—

(1) Sitting head exercise, PP.

(2) Lying left leg flexion, AR, extension, PR; flexion, PR, extension, AR.

(3) Half lying left foot rolling, PP, flexion and extension, PA.

(4) Half lying left leg rolling, PP, flexion and extension, PA.

(5) Half lying left leg rotation externally and internally, PA.

(6) Forwards lying back exercise, PP.

(7) Sitting trunk extension and flexion, PA; sit lying left knee extension and flexion, PP, extension, AR, flexion, PR.

(8) Ride sitting trunk flexion, PR, extension, AR.

(9) Reach grasp step standing left knee flexion and extension, PA, left sciatic nerve frictions, PP.

(10) Reach grasp toe standing double knee bending, PA.

(11) Crook half lying double knee abduction and adduction, PA.

(12) Half lying stomach exercise, PP.

If possible resistance was always offered during the PA exercises, in order to increase their effect.

May 23.—Flexors of thigh stronger. Gluteal muscles and abductors, however, still very weak.

June 2.—Flexors of thigh still improving; gluteal muscles also improving.

June 6.—Anterior tibial muscles improving considerably.

July 10.—Not much improvement during the last month, excepting in the gluteus maximus.

September 25.—Patient finished treatment.

Examination.—Patient could now hobble along a little without any support. The muscles of the left leg as a whole were larger in bulk.

Voluntary movements of left leg.—Hip-joint: flexion, good;

extension, fair; abduction, weak; adduction, good; external rotation, weak; internal rotation, very little.

Knee-joint: flexion, patient could flex it to an angle of 45° with the couch when in forwards lying position, and could offer resistance during knee extension, PR; extension, patient could extend it through an angle of 45° when in sit lying position, and offer resistance during knee flexion, PR.

Ankle-joint: flexion, patient could flex the foot to a right angle with lower leg; extension, very good.

The abdominal and spinal muscles were stronger. There were no reflexes in the left leg. There was no tenderness over the bladder, but still some over the left kidney.

Although this case was not by any means cured, it yet shows what can be effected even where a condition of almost total paralysis has existed for eleven years.

Case 2.

H. S., female, aged 20, came under the manual treatment on May 28, 1900.

History of present illness.—During November, 1898, patient caught a cold; two days later, after a feverish night, she found that she had lost the power of movement in both lower limbs, although sensation in them was intact. She recovered some use of them, however, and after a week could just manage to walk along with assistance. She was then taken to the hospital in Jönköping, where the diagnosis of poliomyelitis anterior acuta was recorded, and the patient was given electricity daily for eleven months. According to patient's account, a good deal of improvement resulted in the left leg, but very little in the right. During November, 1899, she left the hospital, and since then her condition had remained stationary.

Examination.—May 28, 1900.—Patient walked very slowly and with difficulty; her feet were kept apart, they dragged on the ground, and with each step her body leant very much over to the other side. Patient said that she could not walk 300 yards without resting, and even walking 100 yards tired her very much. She complained of repeated attacks of cramp in the muscles of the feet and legs in general; these often came on every two hours day and night; she had to get out of bed and walk about, the

pain being otherwise unbearable. I could not find any cause for these cramps.

Voluntary movements.—The muscles of both limbs were flabby.

Hip-joint: Flexion, right leg, not good; left leg, not good. Patient could not lift either foot off the ground unless she leant very much to the opposite side. Extension, right, weak; she could not accomplish the second part of forwards lying leg flexion, PP, raising, PA; left, rather weak; she could just manage the second part of the exercise just mentioned. Abduction, right, hardly any; in side lying position she could just lift her foot off the other leg; left, fair; in the position just mentioned she could raise her leg to form an angle of 20° with the horizontal. Adduction, right, good; left, good. External rotation, right, weak; left, weak; in half lying position patient lay naturally with her heels apart and her toes touching. Internal rotation, right, good; left, good.

Knee-joint: Flexion, right, not good; left, quite good. Extension, right, not good; she could not in sit lying position extend her knee-joint fully; left, quite good.

Ankle and tarsal-joints: Flexion, right, fair; left, quite good. Extension, right, very weak; even the slightest resistance prevented her executing this movement; left, fair. Eversion, right, none; the foot was kept inverted; left, fair. Inversion, right, quite good; left, quite good.

The abdominal and spinal muscles were also weak. Patient could not perform sitting trunk extension and flexion, PA, without a good deal of help, and had to be supported during stretch stride standing bending forwards, PA, or would have fallen.

There were no reflexes in either leg. No rectal or bladder disturbances were present.

Treatment.

(1) Reach grasp step standing knee flexion and extension, PA, sciatic nerve frictions, PP.

(2) Ride sitting trunk flexion, PR, extension, AR.

(3) Ride sitting double arm abduction, AR, adduction, PR; arm nerve frictions, PP.

(4) Stretch stride standing bending forwards, PA.

(5) Forwards lying back exercise, PP; leg flexion, PP, raising, AR.

(6) Sitting trunk extension and flexion, PA; sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(7) Standing vertebral column stretching, AR at patient's head.

(8) Half lying leg rolling, PP, flexion, PA, extension, AR.

(9) Half lying double foot rolling, PP, flexion, AR, extension, PR; foot eversion, AR, inversion, PR.

(10) Half lying stomach exercise, PP.

(11) Side lying leg lifting, AR, pressing down, PR; leg nerve frictions, PP.

Progress.—May 29.—No cramp during the night.

May 30.—Patient said that she walked a little better.

June 1 to 7.—No cramp.

June 10.—A good deal of cramp.

June 11.—Cramp disappeared and did not return again.

June 15.—Patient walked one and a half miles, to accomplish which took her about two hours. Extension of both ankle-joints better.

June 20.—Abduction at hip-joints better.

July 7.—Extension of both ankle-joints better, that of the left very good.

July 20.—Patient walked one and a half miles, partly uphill, in one and a half hours; she then walked the same distance home in one hour.

August 15.—Abduction of left leg very good. Eversion of left foot very good, that of right foot somewhat better.

August 20.—Patient walked one and a half miles, over the same course as on July 20, in one hour; she then walked home in fifty minutes.

September 15.—Treatment suspended for fourteen days; patient felt so strong that she took a situation as nurse-maid.

October 1.—Patient returned to treatment; from this day onwards she daily walked to and from her place of residence to my house in order to get treatment, distance nearly one mile; at present this took half an hour each way.

October 22.—Patient only took twenty minutes to walk to my house.

November 5.—Patient walked with a slight waddling gait;

the eversion of the right foot was not restored yet, but the movements of the left leg were almost normal. There was a slight patellar reflex on the left side.

December 20.—Treatment finished.

Examination.—Patient walked very much better; she came from her house to mine in fifteen minutes. She only leant her body a little over to one side while walking. There was still a tendency for the feet to be dragged as she walked.

Voluntary movements of right leg.—The muscles of the right leg were still flabby, but the left leg appeared to be quite strong, the only weakness being in abduction of the hip-joint and eversion of the foot.

Hip-joint: Flexion, normal; extension, normal; abduction, good; patient could abduct her leg to an angle of 20° in side lying position; adduction, normal; rotation, external, not good; internal, good.

Knee-joint: Flexion, normal; extension, normal.

Ankle and tarsal-joints: Flexion, good; extension, fair; eversion, fair; inversion, normal.

The abdominal and spinal muscles were much stronger. Patient could perform sitting trunk extension and flexion, PA, quite well without help.

There was a patellar reflex on the left side, but none on the right.

Facial Paralysis of Peripheral Origin.

G. A., male, age 7, came under the manual treatment on August 12, 1898.

History of present illness.—Patient had been running about very much on August 10; while in a great state of perspiration he took a bath in the lake close by. During the morning of August 11 his mother noticed that "his face was crooked." On August 12 it was still crooked, and he could not move the right side.

Examination.—August 12.—There was complete paralysis of the right side of the face, which was smooth; there was lachrymation of the right eye, which remained open. There was no voluntary movement in the right half of the face, neither in the frontal part of the occipito-frontalis muscle, nor cheek, nor in the lower part of the face or lips. The mouth, when patient smiled,

was drawn to the left side. The food collected in the right cheek during eating. Speech was not impaired. Taste and hearing were normal.

Treatment.—Frictions on the facial nerve and its branches. Patient was urged to try and move his face voluntarily. Some general movements were added.

Progress.—The first sign of movement came on August 20; patient could smile a little on his right side. The occipito-frontalis could be wrinkled by August 22. The face was normal by September 10, with the exception that the right eye could not close properly. Treatment was suspended until October 6, when it was resumed by Dr. A. Möller, who cured the remaining eye weakness in three weeks.

October, 1902.—The face was quite normal.

Post-Diphtheritic Paralysis.

(From notes taken by Dr. A. Möller and myself.)

M. G., female, aged 13, came under the manual treatment on October 16, 1899.

History of present illness.—When 8 months of age patient had scarlet fever and diphtheria, with convulsions. Soon after that the paralytic symptoms were first noticed. Many medical men were consulted, who all said that the condition was one of post-diphtheritic paralysis; but none of their prescriptions seemed to have any effect. The condition remained almost unchanged during the next eleven years.

Examination.—The appearance was one of continually half laughing, and the expression was somewhat vacant. The mouth could only be opened about half way. The speech was nasal, although the palate was fairly moveable. There was great difficulty in moving the tongue, as the frenum linguæ was much contracted. The tongue could only be protruded as far as the lower margin of the lower front teeth. Patient could not lift the tongue voluntarily. Salivation was very great in amount and continually running out of the side of the mouth. Patient could not pronounce l, t, d, and n at all; her speech was on the whole very thick and at times almost unintelligible. Swallowing was impaired. There was also partial paralysis of

the right upper extremity; the supinators and extensors of the forearm were very weak, and patient could not oppose her thumb. Frictions on the brachial plexus in the axilla, ulnar nerve, &c., caused sensation only at the point of application, and even that was diminished.

Treatment.

The special exercises were:—

(1) Sitting head exercise and throat exercise; and trigeminal, facial, lingual, and hypoglossal nerve frictions, PP.

Patient had to practise daily protruding the tongue, saying the letters she had special difficulty in pronouncing, trying to breathe without letting the air escape by the nose, &c., in short, trying to do what paralysis had hitherto prevented.

(2) Reach grasp standing head flexion, PR, extension, AR, cervical nerve frictions, PP.

(3) Sitting right arm exercise, including supination, AR, pronation, PR; hand extension, AR, flexion, PR; thumb adduction, AR, abduction, PR, &c.

(4) Stretch grasp standing drawing forwards, PP, kidney frictions, PP.

Some general movements for the constitution were also prescribed.

Progress.—November 15.—Less salivation; swallowing easier. The tip of the tongue could be placed against the upper front teeth. L, t, d and n could be pronounced fairly well; speech was much clearer. Supination better; patient able to open doors needing supination to perform the turning of the handle; she could not do so before on the same door. Extension of the fingers better. The thumb could be opposed to the tip of the little finger.

December 8.—Improvement mantained. Patient compelled to discontinue the treatment for the time being.

February 15, 1900.—Treatment resumed. Speech had slightly improved during absence, and the extensors of the forearm were stronger.

March 15.—Treatment again interrupted. The muscles of the forearm had continued to progress during the last month.

April 3.—Treatment resumed. Frictions on the brachia

plexus, even when not given strongly, caused sensation in the finger tips.

April 14.—Treatment finished. Patient's general condition better. Saliva hardly ever ran from the mouth any more; speech was fairly clear and intelligible, and t and d could be pronounced fairly well. Patient had begun to learn to write with her right hand; both supination and extension of the forearm were very good, and household work could be done with both hands.

The total duration of treatment was about three months and one week. I firmly believe that further improvement, little if at all short of complete cure, would have resulted had patient been able to receive the treatment uninterruptedly from the beginning and to continue it for another few months. Unfortunately this was impossible.

Neuralgia and Neuritis.

I have in several instances produced immediate and permanent relief in quite fresh cases of supraorbital, ulnar, and occipital nerve neuralgia, which came to me within twenty-four hours of the first manifestations of the symptoms. The treatment was, locally, vibrations or frictions over the affected nerves.

Case 1.—Supraorbital Neuralgia.

(From notes taken by Dr. A. Möller and myself.)

Mr. S., engineer, aged 22, came under the manual treatment on February 24, 1900.

History of present illness.—On February 14 patient caught a cold, and severe constant pain set in in the right side of the forehead; this became worse and worse. On February 17 the other side of the forehead was similarly affected. On February 19 patient consulted a medical man who prescribed antipyrin and rest at home for a week. On February 24, as patient's condition had been getting still worse, Dr. A. Möller and I were called in.

Patient complained of severe pain in the forehead, which was intensified by a light friction on the supraorbital nerves. There was more pain in the nerve of the left side. Treatment was

at once administered, consisting of vibrations over the nerves specified and a few general movements. Patient felt much better after it, and there was much less pain.

On February 25 patient walked to my house (distance one mile). He stated that one bad relapse of the pain had occurred during the night, lasting twenty minutes; otherwise he had felt better. There was now no pain in the right supraorbital nerve, although in the left supraorbital nerve some remained; the latter, however, disappeared entirely during the treatment (which was in all essentials the same as before).

February 26.—Very slight pain in the nerve of the left side. Treatment for the last time.

July 20, 1900.—No relapse of any kind whatever had taken place.

Case 2.—Sciatica.

H. L., male, occupation metal polisher in a factory, aged 30, came under the manual treatment on August 19, 1902.

History of present illness.—About nine weeks ago patient began to feel a continued boring pain in his right thigh and gluteal region; although at first slight this pain increased in intensity, and after about a fortnight was so bad that he could not sit without great inconvenience. He was by this time unable to bend forwards so as to pick up anything off the ground. His condition became worse, and on July 25 he was obliged to cease work at the factory. On August 15 he consulted Dr. Eric Hellberg, of Jönköping, who recommended him for the manual treatment. No internal remedies were prescribed.

Examination.—Patient walked with a slight limp. He complained of continued severe boring pain in the gluteal region and back of the thigh, occasionally extending down the back of the lower leg. He could sleep fairly well in spite of the pain. Occasionally there were acute exacerbations of the pain even when standing still, and the pain was aggravated by sitting down. Any movement that stretched the painful parts greatly increased the pain; patient could for example in stretch stride standing position hardly bend the trunk forwards. There was great atrophy of the gluteal muscles and of the thigh muscles posteriorly, also to a less extent of the muscles of the calf. There

was great tenderness to pressure over the course of the superior gluteal, inferior gluteal, great sciatic and internal popliteal nerves, and to a less extent over the posterior tibial, internal plantar, and external popliteal nerves.

Treatment.

A great deal of attention has lately been directed to the muscular atrophy so constantly found in cases of sciatica even if of comparatively quite recent standing, and massage of the atrophic parts has been strongly recommended by many authors. This procedure, no doubt, in the course of time cures some cases, but I consider that this is due chiefly to the manipulation reaching the affected nerve, and not to the stimulation of the muscles. It must be borne in mind that in bad cases of sciatica a primary neuritis has to be dealt with, and that the atrophy of the muscles is secondary to it.

The manual treatment is directed towards the real seat of the disease, *i.e.*, the great sciatic nerve itself. Local treatment is administered, consisting of vibrations, and as soon as possible frictions, on the nerve itself, and movements of the leg to promote the circulation of the blood and lymph. Movements are also prescribed that alternately stretch and relax the affected nerve. General constitutional exercises are added in order to raise the vital activity of the body as a whole.

The following was the prescription in the case which is being described :—

(1) Reach grasp step standing right knee flexion and extension, PA, given with vibrations on the gluteal and great sciatic nerves, PP.

(2) Forwards lying back exercise, PP ; right leg flexion, PP, raising, AR.

(3) Stretch stride standing bending forwards, PA.

(4) Stretch half lying running nerve frictions, PP, kidney frictions, PP.

(5) Ride sitting trunk flexion, PR, extension, AR.

(6) Lying right leg flexion, PR, extension, AR.

(7) Half lying right leg rolling, PP, flexion, PA, extension, AR.

(8) Stride sit kneeling raising, AR.

(9) Half lying stomach exercise, PP, followed by vibrations on the affected nerves, PP.

In exercises (1) and (9), frictions were substituted for vibrations at the earliest opportunity, as soon as the pain had sufficiently diminished.

Progress.—September 30.—Treatment finished. Owing to my temporary absence I did not see patient until October 5, 1902.

Examination.—Patient much better. No pain in the gluteal or great sciatic nerve or its ramifications on standing still or on sitting down. After walking a good deal a little pain sometimes felt. Patient able to execute stretch stride standing bending forwards, PA, until his finger-tips touched the ground; a little pain caused meanwhile. Atrophy of muscles considerably less. No tenderness to pressure over the superior and inferior gluteal nerves; some still remaining over the great sciatic nerve in its upper part.

Patient returned to his work at the factory on September 27, 1902. Further history unknown.

Case 3.—Sciatica.

(Treated by Dr. A. Möller and myself.)

K. K., male, aged 40, whose occupation was that of attending to a screw-making machine, which necessitated his standing all day, came under the manual treatment on August 29, 1898.

History of present illness.—About September, 1897, patient began to suffer from pain in his right thigh posteriorly in the region of the great sciatic nerve; the pain became steadily worse, and about Christmas began to disturb his sleep. It now also appeared in the back of the lower leg, became continuous, and was of a gnawing character. By the end of March, 1898, it was so bad that he was obliged to stop work. He tried a two month's treatment of Ling's medical gymnastics, but this had no effect; he then underwent a bath and massage cure for five weeks, which made him somewhat better; on coming home he tried to work again. The sciatica, however, at once got worse, and in a fortnight was as bad as before; patient was obliged once more to cease work.

Examination.—Patient looked pale and thin. He said that he

slept very little indeed, the pain in his leg being so bad. He walked with a slight limp, and complained of constant severe gnawing pain in the back of the right thigh and lower leg in the area of the great sciatic, internal popliteal, and posterior tibial nerves. This was greatly aggravated by movement, even by flexion forwards of the head, which caused the pain to be felt also in the region of the internal plantar nerve. From stretch stride standing position, flexion forward of the trunk could not be executed through more than an angle of about 10°, on account of the great pain induced. There was great tenderness to pressure along the whole of the right great sciatic nerve and its prolongation down to the internal plantar nerve, the tenderness in the latter, however, not being so marked as in the former. There was considerable atrophy of the whole of the muscles of the right thigh and lower leg, the difference between the maximum circumferences of these parts being about an inch less than the corresponding ones on the left side.

The treatment was on the lines already indicated.

Progress.—After the first week improvement set in and patient could sleep better. From the eighth day onwards the pain became less severe, and patient could perform the movements that stretched his affected nerves with increasing facility. By the end of September he could execute stretch stride standing bending forwards, PA, so far that at the conclusion of the flexion his finger-tips touched the ground. By the middle of October the pain had quite disappeared, and there was no appreciable difference in the circumference of the thigh and lower leg of the right and left legs respectively. Patient continued treatment until October 30, when he was quite cured.

I saw patient again during August, 1902. He said that after standing very much his right leg felt more tired than his left; otherwise there was nothing abnormal to be recorded, and he had never had the slightest return of the pain.

Mental Overwork.

Miss H., schoolmistress, aged 32, of a nervous temperament, came under the manual treatment on April 24, 1900.

History of present illness.—Patient had for some months past had a great deal of brain work to do, and for three weeks past she

had felt day by day progressively weaker. On April 21 during the morning and afternoon she had about ten distinct attacks of a peculiar nature; she suddenly had amaurosis and felt as if she were being lifted up and thrown down on the ground. A few seconds later vision returned, and she was surprised to find that she was still standing up. Great heat and heaviness in the head accompanied these attacks, and was present to a minor degree during the intervals; between the attacks she had considerable difficulty in walking, as her legs felt shaky. Palpitation came on every now and then. On April 22, having slept very badly, patient woke up feeling very weak, and with a commencing sensation of sickness. As it was Sunday, she did not need to go to school, and became a little better during the day as she was able to keep quiet. On April 23 she went to school again, and just managed to get through her work. The sensation of sickness was worse. Her appetite remained good, however, during the whole time, and she usually felt better after eating. On April 24 she again went to school, but felt so bad that she had to lie down on a sofa in the teachers' room soon after arriving, and later on was compelled to go home.

Examination.—April 24.—Patient complained of weakness, headache, feeling of heat in the head, and unpleasant sensations in the epigastrium. She stated that she was totally unable to read, and the very idea of doing so was almost unendurable. Patient was thinner than when I saw her fourteen days previously, and looked somewhat anæmic. The head was very hot to the touch, specially in the occipital region. There had been palpitation at intervals during the day.

Treatment.

(1) Sitting head exercise, PP.

(2) Forwards lying back exercise, PP.

(3) Ride sitting trunk flexion, PR, extension, AR.

(4) Ride sitting double arm abduction, AR, adduction, PR; arm nerve frictions, PP.

(5) Ride sitting alternate rotation, AR; ringing, PP, added later on.

(6) Stretch stride standing bending forwards, PA.

(7) Half lying leg rolling, PP, flexion, PA, extension, AR.

(8) Sitting trunk extension and flexion, PA.

(9) Half lying stomach exercise, PP.

Progress.—After the first treatment patient felt better; she slept very well during the ensuing night.

April 25.—Patient still quite unable to attempt reading. After treatment she was rather giddy all the evening (time of treatment was 5 p.m.) until 11 p.m., when she retired to bed and slept well.

April 30.—Steady improvement daily since April 26. Patient still felt very weak, but her head was a good deal better.

May 1.—Patient had slept badly. Condition otherwise about the same.

May 2.—Patient felt very well; the school class came to her house and received an hour's instruction.

May 3.—Patient very well. No class to teach during the day, as the work was done by others.

May 4.—Patient drove to school and gave an hour's instruction. She walked home (distance fifteen minutes' walk).

May 5.—Patient walked half way to school, and drove the other half. She gave one hour's instruction and then walked home.

May 6 (Sunday).—Treatment. Patient almost well. Palpitation during the evening.

May 7.—Patient walked to school and back, and taught for four hours. Her head remained quite well, but was easily fatigued.

May 8.—Patient rather tired after the efforts of the previous day. Head as on May 7. Occipital region much less hot than on April 24.

May 9.—Condition about the same. Four hours teaching at school.

May 10.—Patient slept excellently during the night; walked to school quite easily; felt very well and did her four hours' work with ease. She was tired in her head during the afternoon; this disappeared after treatment.

May 11 and 12.—Treatment both days. Patient was able to teach as usual on both days. On 12th (Saturday) she felt tired, but revived during the afternoon.

May 13.—No treatment. Very tired all day.

May 14.—Diarrhœa early in the morning and once again at

night; after it patient felt better than on any occasion since her illness.

May 16, 17, 18, 21, 23.—Patient very well indeed during all this week. Treatment once daily.

May 25, 28.—Treatment.

May 29.—School finished for the term.

June 1, 2.—Treatment. Patient very well indeed.

June 5, 6, 8, 9, 11, 12, 14, 15.—Treatment. Patient very well indeed.

June 15.—Treatment finished. Patient normal.

Sequelæ of Influenza.

Case 1.

(From notes taken by Dr. A. Möller and myself).

Miss T., aged 23, schoolmistress, came under the manual treatment on October 13, 1899.

History of present illness.—Patient had influenza in February, 1899, and ever since then, when teaching, had had violent neuralgic attacks either in the supraorbital or lateral frontal regions, with headache all over the head, and much pain in her eyes. These attacks generally came on after she had been working about half an hour, and lasted sometimes all day, *i.e.*, from 9 a.m. to 5 p.m., at which hour school finished; sometimes they lasted all the evening as well. Patient's general condition had become weakened and nervous.

Examination.—The supraorbital and great occipital nerves were very tender to the touch. The head felt hot. Patient was very sensitive over the whole body wherever I touched her.

Treatment.—The special movements prescribed were:—

(1) Sitting head exercise, with vibrations over the affected nerves and the eyeballs, PP.

(2) Reach grasp standing head flexion, PR, extension, AR, cervical nerve frictions, PP.

(3) Forwards lying back exercise, PP.

(4) Stretch grasp standing drawing forwards, PP, kidney frictions, PP.

Besides these, some other general movements were added.

Patient could not leave off her teaching, and continued it daily as usual.

Progress.—October 25.—Neuralgia less intense.

October 26.—Only one neuralgic attack, lasting half an hour.

November 2.—No neuralgic attack at all during the previous day. Headache better.

November 9.—Hardly any headache during the last week.

November 11.—Patient considered herself practically cured. No headache.

August, 1900.—After very hard work a slight pain was occasionally felt in the supraorbital region; otherwise patient had kept quite well since the treatment was finished.

Case 2.

(From Notes taken by Dr. A. Möller and myself.)

J., aged 39, coachman, came under the manual treatment on November 19, 1899.

History of present illness. — Patient drank a good deal. During March, 1899, he had an attack of influenza, and got up too soon. Since then he had continually suffered pains in his head and body generally; these pains were not always in the same place, but moved about. He sometimes had attacks of giddiness and buzzing sounds in his head. There was general nervousness and weakness. Patient was shaky on his legs. His appetite had remained fairly good, but both taste and smell had become deficient. His condition had existed almost unchanged since getting up after influenza, in spite of various remedies prescribed. Nothing particular could be elicited on examination, except that the back of the head was hot to the touch.

Treatment.

(1) Sitting head exercise, including ear vibration, PP.

(2) Reach grasp standing head flexion, PR, extension, AR, cervical nerve frictions, PP.

(3) Heave grasp standing chest clapping, PP, side shaking, PP.

(4) Forwards lying back exercise, PP.

(5) Half lying double foot rolling, PP, flexion and extension, AR.

(6) Stretch grasp standing drawing forwards, PP, kidney frictions, PP.

(7) Stretch stride standing bending forwards, PA.

(8) Half lying double leg rolling, PP, flexion, PA, extension, AR.

(9) Half lying stomach exercise, PP, spleen frictions, PP.

Progress.—November 20.—Patient easier in his head.

November 28.—Patient still easier in his head.

December 2.—No pains in body; some buzzing sounds in head; patient otherwise felt quite well.

December 16.—Smell and taste restored; patient very nearly normal. Treatment interrupted until January 4, 1900.

January 4, 1900.—Patient returned to treatment, as the pains in his body had recommenced.

February 7.—Occasionally feeling of giddiness (perhaps due to the alcohol taken). Patient otherwise normal. Treatment finished.

June, 1902.—Patient keeping quite well.

Chronic Headache.[1]

Mrs. C., aged 38, came under treatment on November 1, 1900.

History of present illness.—Ever since the age of 15 she had suffered from continual headache, with only occasionally a few days intermission. The usual course of the headache was as follows: On waking up there was not much. After getting up a slight amelioration sometimes occurred; then usually an acute attack came on; in about two minutes violent pains were felt in the back of the head; these spread up to the vault of the skull and settled there as well. Then the temples and eyes became affected. Usually patient was so bad that she could not even read. During the afternoon the pains subsided somewhat; but during the evening they often became worse again.

Patient continually suffered from cold legs and feet, and slept badly. Movement and exertion usually aggravated the condition; mental worry nearly always did so. At meal times there was, if anything, a slight improvement.

[1] A great deal has of late been made of the supposed fact that chronic neuralgic headache can be caused by myositis of the neck muscles; massage of these muscles has been recommended, and good results appear to be obtained thereby. To my mind the muscular affection is secondary to a primary nerve irritation, and much quicker results can be obtained by nerve vibrations.

Treatment.

(1) Sitting head exercise, PP.

(2) Reach grasp standing head flexion, PR, extension, AR, frictions on the second cervical nerves, PP.

(3) Ride sitting double arm abduction, AR, adduction, PR, arm nerve frictions, PP.

(4) Half lying double foot rolling, PP, flexion and extension, AR.

(5) Forwards lying back exercise, PP.

(6) Stretch half lying double arm rolling, PP, bending and stretching, AR.

(7) Sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(8) Heave grasp standing chest clapping, PP, side shaking, PP.

(9) Half lying leg rolling, PP, flexion, PP, extension, AR.

(10) Half lying stomach exercise, PP.

Progress.—November 8.—Headache had been gradually diminishing during the week. None at all during this day.

November 14.—No return of the headache until this evening.

November 15.—No headache.

November 16.—A little headache, as patient had worked very hard during the previous evening.

November 17.—No headache.

November 28.—No headache since November 17. Feet and legs now always warm. Patient said that she felt very well. Treatment finished.

July, 1902.—No return of the headache.

Epileptic Seizure while Bathing.

A., factory worker, aged 35, came under the manual treatment on July 19, 1900.

History of present illness.—Patient had suffered from chronic rheumatism for a year. Two months ago he was operated on for hæmorrhoids, and since then had not felt very well. On July 19, 1900, he went to bathe. Suddenly he felt a kind of cramp in his feet, and he remembered feeling it passing up his legs and abdomen. He felt he was falling and screamed for help. After

that he remembered nothing more. The friends of the patient told me that they saw him fall back into the water and disappear entirely from view, and about five minutes elapsed before they were able to get him out. When at last they did he was in a state of opisthotonic rigidity. They tried to perform artificial respiration. Dr. Harry Kellgren and I were sent for and arrived at 5.45 p.m., fifteen minutes after the accident.

Examination. — Patient profoundly unconscious, markedly cyanotic, eyes closed. Breathing laboured and stertorous; continued spasmodic movements of the head, which was turned to the left side. Every now and then the eyes opened and I saw that both pupils were widely dilated. Occasionally spasmodic movements of the lower limbs took place, and at fairly regular intervals of a few seconds patient screamed aloud, his cry somewhat resembling that heard in cases of tubercular meningitis. The pulse was imperceptible.

We immediately performed artificial respiration, together with cervical and other nerve frictions; the breathing became less laboured, but the movements of the legs increased and spasmodic movements of the arm commenced. The spasmodic movements of the head were now such that the head was turned alternately to both sides, not only to the left as before. I now noticed when patient opened his eyes that the left pupil was larger than the right.

At 6.45 p.m. patient was still profoundly unconscious, the spasmodic movements and screaming continuing. We took him to a house close by and placed him sitting up. Every few seconds patient rose on his feet with a scream and assumed a position of opisthotonic rigidity; this would last a second or two and then he would collapse into the chair again. A wrist-drop in the right hand was noticeable for the first time. The treatment was now chiefly stimulatory nerve frictions.

7.30 p.m. Wrist-drop disappeared, patient somewhat quieter; pulse very weak, so rapid that it could not be counted, and very irregular. Patient was driven in a carriage to his house, and on the way he every now and then, after a preliminary scream, assumed a position of opisthotonic rigidity, or sat up for a few seconds, collapsing again as before.

8 p.m. Patient arrived home and we set him in an armchair. The spasms of the body and extremities were getting less, except-

ing in the head; and there was less screaming. Patient was still quite unconscious. Treatment was now chiefly directed to drawing blood away from the head.

9 p.m. Faint gleams of returning consciousness.

10 p.m. Patient fairly quiet; but cardiac action feeble and irregular.

11 p.m. Patient quite quiet. Heart's action very weak, 136 per minute, irregular and intermittent. Respiration still somewhat laboured; many bubbling sounds in the chest plainly audible at a considerable distance (even ten feet away in the room adjoining). The treatment since 9.30 p.m. had been chiefly heart vibration and shaking. It was necessary to maintain treatment over the heart continuously; as soon as it was stopped the heart became very irregular, and the treatment had to be resumed at once. From 9.30 p.m. to 1 a.m. the heart could not be left alone for more than five minutes, without giving signs of speedy failure.

July 20.—12 midnight. Heart treatment was gradually given to a less and less amount from now onwards. Pulse 126, more regular.

12.15 a.m. Pulse 120, still very weak.

1 a.m. Pulse 116, weak, more regular. Patient opened his eyes when his name was called very loudly.

2 a.m. Patient tried to speak once or twice. Pulse 108; heart treatment only administered every few minutes for a minute or two. Patient, who had been sitting in an armchair till now, was put to bed.

2.30 a.m. Patient had turned over in bed twice by himself. Heart treatment only very occasionally.

3 a.m. Patient recognised his wife. Pulse 100, regular.

3.30 a.m. Patient suddenly vomited a large amount of coffee-coloured liquid, after which he recovered consciousness. He remembered nothing since he fell down into the water, and wondered why I was in attendance.

4.45 a.m. Patient quite rational again. Pulse 85, strong, regular. I ceased treating patient and went home.

During the afternoon I saw patient again. He was weak and sore in the places where we had given him the nerve frictions, but otherwise was fairly well. I executed some movements for the lungs and heart.

July 21.—Appetite normal. Patient went for a short walk. Treatment at home once.

July 22.—Treatment at home once. Patient felt very well; better than before the seizure.

July 23.—Patient walked to my house and back (distance about one mile each way). Some rheumatic pain was present in the left toe and shoulder.

Treatment henceforth once daily, consisting of:—Movements of joints, such as:—

(1) Half lying double arm rolling, PP, bending and stretching, AR.

(2) Half lying double leg rolling, PP, flexion, PA, extension, AR.

(3) Half lying double foot rolling, PP, flexion, AR, extension, AR.

Also respiratory movements, stomach exercise, PP, kidney treatment, PP, head exercise, PP, &c.

Progress.—The pains in the toe and shoulder disappeared after a few days, and after appearing in other joints for a few days more finally vanished.

On July 23 patient returned to his work at Huskvarna factory.

August 23.—Patient felt very well indeed, much better than for years past. He had had no rheumatic pains at all during the last ten days. He had during the time under treatment got rid of a slight chronic catarrh of the lungs, from which he had suffered all his life. Treatment finished.

August, 1902.—Patient still keeping very well.

A case of "Gunshot Injury to the Musculo-Spinal Nerve," treated by Henrik Kellgren, has been described by Owen in the *Lancet* for November 18, 1876, pp. 709, 710. In the same journal for December 3, 1876, p. 806, is found a letter from Sir W. H. Broadbent, stating that he saw the case before and after treatment, and certifying to the speedy recovery that took place.

CHAPTER IX.

DISEASES OF THE LOCOMOTOR SYSTEM.

Chronic Rheumatism.

Case 1.

Mr. K. N., builder, aged 40, came under the manual treatment on November 9, 1900.

History of present illness. — Patient thought that he first began to suffer from rheumatic pains about five years previously; he could not ascribe any particular cause. Since that time he had been suffering from pains and stiffness, particularly in the shoulders, back and hip-joints, but also in the arms. There was difficulty and pain on movement at first, although a good deal of movement relieved the condition for the time being. He had never been very bad, and had never had to stop in bed. The rheumatic symptoms were absent during the warm months in the summer time, but always returned during September or October, and remained until the following summer. Patient had never consulted any medical man about his rheumatism, and had never taken any internal or external remedies. For the week preceding November 8 patient had been suffering from rheumatic pains in his left hip and right shoulder. On November 8 he became very hot over some work, and while walking home thought he caught cold. The pains mentioned became much worse in the course of the night; he slept very badly, perspired a good deal and thought he had some fever. The next morning, November 9, he had pains in his back, both arms, and both hips, especially the left. The left hip was so painful as to prevent him walking. Patient drove from his house to mine, distance two-thirds of a mile.

Examination.—Patient walked with the help of two sticks and tried to use his left hip as little as possible. He complained of great pain in that joint, also in the spinal muscles and both shoulder-joints. Pressure over the hip-joint, a blow on the foot with patient lying down and his knee-joints extended, and any

attempted movement of the affected joints greatly increased the pain. There was no fever; the pulse while patient was lying down was 88 per minute.

Treatment.

Vibrations followed by passive flexions, extensions, &c., at the affected joints. A great amount of traction was necessary, or the patient would not have endured the exercises because of the pain; the movements had to be executed through a very small radius at first, and their extent gradually increased. In this way, after about ten minutes or so, I could administer passive leg rolling with very little pain to the patient. I also executed movements at the other joints of the body, stomach exercise and kidney frictions, PP, forwards lying back exercise, PP.

Progress.—After the first treatment patient was so much benefited that he could walk home.

November 10.—General condition better. No pain except in left hip. Treatment as before; patient better after it.

November 11.—No treatment.

November 12.—No pain in left hip or anywhere else. Treatment.

November 15. — Treatment finished. No rheumatic pains anywhere.

During the evening of the 15th, patient worked out in the open air in cold weather, and became wet through with perspiration. No bad effects resulted, however.

March, 1902.—No return whatever of the pains.

Case 2.

E. A., male, aged 35, came under the manual treatment on August 18, 1902.

History of present illness.—Patient had for years past, every now and then had rheumatic pains in his legs and arms, although until the present attack never so badly as to prevent his working. Patient had never taken any internal or external remedies for these pains. About July 15 he was caught in the rain, and during the same evening felt pain and stiffness in his lumbar region, aggravated during flexion forwards of the trunk. Rheumatic pains in the arms and legs, which had been present to a slight extent all the previous week, became intensified. After a

few days there was considerable difficulty in walking, and sleep was disturbed by the pains at night. His condition remained about the same until August 15, when he was attacked by shivering and perspiration, and his rheumatic pains were much worse. He felt very ill and had to cease work; he went home and stopped in bed all day, also during the following day. On August 18 he had so far recovered that he could walk to my villa for treatment, although this caused him a good deal of pain.

Examination.—Patient walked with a limp in his right leg. Great tenderness to pressure over the right gluteal region round about the great trochanter, along the outer side of the thigh, and in both lumbar regions. Pain and stiffness on movement of the right leg, especially during excentric extension and during flexion forwards of the trunk. Patient also complained of some pain in the arms and left leg, although no specially tender spots could be determined. Temperature 99·2°.

Treatment. — Kneading of the affected parts, movements at joints to exercise them, forwards lying back exercise, stomach exercise, and kidney frictions.

Progress.—On August 22 patient was so much better that he resumed work. On August 23 all the pain, stiffness and tenderness had entirely disappeared, and patient said that he felt quite well and strong. Treatment finished.

September 14.—No return of the pains.

It will be observed that in both the foregoing cases neither of the patients had ever tried any remedies for their rheumatism previous to their coming under the manual treatment. To this fact I attribute the rapid result. My experience has gone to show that the more previous medicinal treatment rheumatic cases have had the harder they are to cure by the manual treatment. Personally, I should hold out more prospect of cure to a long-standing case of rheumatism that had never received any treatment than to a similar case of shorter duration which had undergone a good deal of medication.

Case 3.—Lumbago.

In fresh cases of lumbago, in which spasmodic contraction of muscles seems to play an important part,[1] relief can sometimes

[1] *Cf.* Georgii, "Kinetic Jottings," 1880, p. 175.

be produced at once by vibrations, followed by frictions on the affected muscles.

In old cases, however, where the condition appears to be more an inflammatory process of the whole or part of the erector spinæ, the treatment is as follows :—

(1) Manipulations such as vibrations, frictions, hackings, beatings over the affected muscles.

(2) Exercises during which the affected muscles are alternately passively elongated and shortened.

(3) Exercises during which the patient has to put the affected muscles into excentric and concentric contraction.

(4) Exercises to stimulate the nerves to the affected muscles.

(5) Exercises to benefit the constitution as a whole.

S., aged 27, employed in the iron founding department in the factory at Huskvarna, came under the manual treatment on May 29, 1900.

History of present illness.—He said that he first began to feel stiff in his back about a year previously; about six months later this began to cause him serious inconvenience. A medical man he consulted diagnosed rheumatism and gave him powders. These did not help him at all, and he got worse and worse. Early in May he ceased work for a few days, but the rest did him no good; after this he tried again to work, but was compelled to stop after a few days. Another medical man who was consulted diagnosed lumbago, and recommended gymnastic treatment.

Examination. — The spinal muscles on both sides from the sacrum up to the sixth dorsal vertebra were very hard and resistant and painful on manipulation; even slight flexion of the trunk forwards or sideways caused the patient much pain, as did any other movements involving active contraction or stretching in the muscles referred to.

Treatment.

(1) Ride sitting trunk flexion, PR, extension, AR.
(2) Stretch stride standing bending forwards, PA.
(3) Leg lean stride standing trunk flexion, PR, extension, AR.
(4) Side lying leg lifting, AR, pressing down, PR.
(5) Lying double leg flexion, AR, extension, PR.

(6) Lying leg flexion, PR, extension, AR.

(7) Hip lean walk standing lateral flexion, PR, extension, AR.

(8) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(9) Forwards lying back exercise, PP, with extra frictions over the most painful muscles, PP.

(10) Half lying stomach exercise, PP.

Progress.—Patient felt better immediately after the first treatment, and he continued to improve until June 16, when he caught a feverish cold. He was treated at home on June 16, 17, and 18. On June 19 he was able to come to me again, and the only pain he felt was over the left side of the sacrum when the muscles of this region were placed into action. On June 30 he was practically well; on July 2 he began to do some light work at the factory. He continued the treatment a few days longer to prevent relapse, after which he left me quite cured, and shortly afterwards worked again in the iron founding department.

April, 1902.—No return of the symptoms.

Case 4.—Lumbago.

I., aged 35, worker in Huskvarna factory, came under the manual treatment on October 3, 1899.

History of present illness.—Patient had been suffering on and off for five years from lumbago, which had been a good deal worse the last six months.

Examination.—There was considerable pain during any movement entailing flexion of the trunk; and on trying to get up after sitting still, sharp stabbing pains were felt in the lumbar region. The muscles of the back from the sacrum to about the second dorsal vertebra were hard, resistant, and tender to pressure.

The treatment was on the same lines as in the foregoing case, and was administered daily until November 3, 1899, when patient left, being cured, and having no more pain or stiffness of any kind.

August, 1900.—Patient said that during the past winter he had occasionally felt slight pain on movements entailing strong flexion forward of the trunk, otherwise he had been quite well ever since the treatment finished.

Case 5.—Lumbago.

J. O., male, aged 38, came under the manual treatment on February 9, 1901.

History of present illness.—Patient had been suffering from pains in the lumbar region for about three weeks, brought on, he said, by catching cold.

Examination.—There was tenderness over the back on both sides from the sacrum to the tenth dorsal vertebra. There was difficulty in bending the trunk forward, and in any other movement involving the lumbar and sacral spinal muscles.

Treatment. — Commencing with vibrations on the affected muscles, I increased the strength of the manipulation until they became strong frictions. These at first caused pain, but not afterwards. The patient was then given stretch stride standing bending forwards, PA, with backing over the lumbar region, after which he said that the pain had entirely disappeared.

August, 1902.—No return of the symptoms.

Partial Rupture of the Gastrocnemius Muscle.

Lieutenant E. C. F., student at the Central Gymnastic Institute, came under the manual treatment on October 21, 1898.

History of present condition. — On October 13, 1898, after having finished an hour's pedagogical gymnastics, patient was seized with sudden pain in the right calf. The pain increased in amount, and the day after the seizure patient noticed that there was considerable swelling over the middle of the calf, and that the part was discoloured, being dark blue. He was able to walk a little, though with much difficulty and pain, and came to the clinique at the Institute.

Examination.—The middle third of the calf was deeply discoloured from extravasated blood, and there was considerable swelling. There was great tenderness along the inner border of the gastrocnemius and soleus in the middle third of the calf, and the affected part was hotter than normal. Passive extension of these muscles caused pain. Prof. Murray, who was consulted, diagnosed ruptura musculi in the right calf.

Treatment and progress.—The patient did not come under my

care at once, but was treated by massage, fat being first duly rubbed on the part manipulated. This was continued daily from October 14 to 20 inclusive, with very little or no benefit. On October 21 I treated the case for the first time. I chiefly administered vibrations over the part, nerve frictions on the internal popliteal nerve, and running vibrations and frictions given centripetally. On October 22 patient was much better, and had but little difficulty in walking. No treatment was administered on October 23. On October 24 the pain had almost completely disappeared, and patient fenced for an hour with only slight inconvenience. The next day he practically felt no pain. I continued treating him, however, until October 31, on which day the last of the extravasation and discolouration disappeared.

April, 1899.—Calf muscles quite normal.

Chronic Synovitis, &c.

(From notes taken by Dr. A. Möller and myself.)

B. J., male, aged 25, came under the manual treatment on February 14, 1900, suffering from chronic synovitis in the right knee, chronic pains in the abdomen, chronic laryngitis, headache and general depression.

History of present condition.—About two years previously his right knee had begun to be stiff and to hurt him; it got better after some time, but then worse again. He went on alternately getting better and worse, and then became steadily worse for three months before he came to me. At intervals, when his state was at its worst, he was unable to stand on his right leg with the left foot lifted off the ground, and much pain was caused on walking. For about fourteen months he had suffered almost constantly from pains in his epigastric and left hypochondriac regions, and the slightest touch over these parts often hurt him very much; sometimes he could hardly bear having his clothes on. At Easter, 1899, he consulted a medical man, who diagnosed gastric catarrh and prescribed Carlsbad water and castor oil. Patient felt somewhat better during the period he took these remedies, which was one month; but as soon as he left off he was just as bad again. Often when the pain in his abdomen was very

bad, relief was to some extent obtained by getting a friend to give him a kind of abdominal massage.

Every now and then the patient became very depressed and could not be cheered up. A chronic laryngitis had been present for some years; it had been rather worse during the last few months.

Examination.—Patient could not stand on the right leg and lift up the left one without considerable pain in the right knee; he walked in a somewhat limping way, hurrying over the time he had to support himself with his right leg. He could not flex the affected knee further than a right angle without very much pain, and even flexing it so far hurt him. There was a very tender spot just internal to the right patella. The muscles of the abdomen were contracted and hard, especially in the subcostal triangle, where there was great tenderness to touch.

Treatment.

(1) Reach grasp step standing knee flexion and extension, PA, right knee-joint vibration and kneading, sacral beating, PP.

(2) Stretch grasp standing drawing forwards, PP, shaking of the pit of the stomach, PP.

(3) Sitting trunk extension and flexion, PA; sit lying right knee extension and flexion, PP, extension, AR, flexion, PR.

(4) Stretch lean toe standing double knee bending, PA.

(5) Heave grasp standing chest clapping, side shaking, PP.

(6) Stretch grasp toe standing hanging, breathing, PA.

(7) Forwards lying back exercise, PP, right leg flexion, PP, raising, AR.

(8) Stride sit kneeling raising, AR.

(9) Half lying double leg rolling, PP, flexion, PA, extension, AR, right knee-joint kneading, PP.

(10) Half lying stomach exercise, PP.

(11) Sitting head and throat exercises, PP.

Progress.—March 14.—Patient said that his leg was much better; during ordinary movements there was hardly any pain; sharp pain only came on with extreme flexion. The tenderness over the spot internal to the patella was much less. Patient, however, very soon became tired in the affected knee when walking.

The pains in the abdomen had disappeared; patient said that his digestion had not been in such good order as now for some years. The abdominal muscles were less tense, and there was but little tenderness in the epigastrium. Patient no longer suffered from headaches. The laryngitis was better.

April 7.—The right knee had continued to improve, and became less tired on exertion.

April 14.—The only abnormal symptom in the right knee was a feeling of fatigue, which, however, only came on after a considerable amount of walking Patient said that his digestion was splendid. He was free from headaches; the depression had left him, and he was continually in a cheerful state of mind. The laryngitis was slightly better. Treatment finished.

July 18, 1900.—Patient was still feeling very well, although still liable to slight stiffness in the right knee after much walking.

July, 1902.—Condition of knee unchanged.

Abscess in the Antrum of Highmore.

Mrs. A., aged 48, came under the manual treatment on April 21, 1900.

History of present condition. — Patient noticed on April 12, 1900, that her nose felt stuffy on the right side, and that, on getting up, a quantity of bad-smelling yellowish matter came out of her nostril; each subsequent morning a great deal of discharge came, as patient, in consequence of weak cardiac action, always slept on her right side. Leaning her head over to the left side usually induced a discharge, or if already in progress it was increased in amount.

Examination.—Patient complained of continued pain in the right supramaxillary region, and discharge from the nose. On flexing the head laterally to the left, some thick yellowish bad-smelling pus appeared from the nostril. The right cheek was red and tender to touch, and there was pain on slight percussion.

Treatment.—The special treatment for the antral abscess was as follows :—

Sitting right superior maxillary vibration with the patient's head flexed to the left; vibrations on the root of the nose; right trigeminal nerve frictions; right facial nerve frictions.

Progress.—April 23.—Discharge less. Less tenderness over the cheek.

April 24.—No pain in cheek whatever.

May 28.—Patient had been feeling very well during the last month; the discharge, however, had remained almost constant in quantity. On this day it was thinner than usual.

June 2.—Discharge still thinner.

June 4.—Discharge looked like water.

June 5.—No discharge, no tenderness. Nose apparently normal.

June 16.—Treatment finished. No discharge or tenderness since the 5th.

August, 1902.—No return of discharge.

Dislocation of the right Humerus.

(From notes by Dr. A. Möller and myself.)

S., aged 48, worker in Huskvarna factory, came under the manual treatment on November 15, 1899.

History of present condition.—Patient had on three previous occasions dislocated his right humerus, *i.e.*, (1) in 1886; (2) in 1896, when chloroform was used in order to replace it; and (3) in November, 1898. The present dislocation occurred at 9 a.m. on November 15.

Examination.—10 a.m. same day. There was dislocation forwards of the right humerus; the right arm hung limp and useless, there was a depression below the acromion, and the elbow projected backwards. The head of the humerus could be felt lying under the pectoralis major. There were no signs of swelling. There was very much pain in the region of the joint, and patient was pale and shivering.

Treatment. — The dislocation was reduced as follows:—The arm was lifted high up into stretch position; then, asking the patient to resist as much as possible, I performed adduction of the right arm with traction away from the shoulder, bringing the whole limb somewhat forwards as I went. While doing this Dr. Möller pressed in the head of the bone. The object of this procedure was: first, by traction to bring the head of the humerus over the rent in the capsule; the exertions of the patient to resist

caused the deltoid to act as a fixed point of a lever, one end of which was from that point to my grasp on the forearm, and the other from that point to the head of the humerus. The bringing downwards and forwards of the distal end of the arm caused the head of the humerus to pass upwards and backwards into the capsule again.

Immediately after reduction of the dislocation the following movements were administered on the joint :—Vibrations to prevent inflammation : duplicate movements at the shoulder-joint in order to exercise, and thus strengthen, the muscles weakened by the displacement, taking care to avoid those which would cause the head of the humerus to pass downwards, *i.e.*, such movements as the following were given :—

Swim sitting right elbow pressing downwards, PR.

Sitting right forearm flexion, AR, extension, PR.

Sitting right arm traction sideways, PP, followed by the patient trying to draw his arm towards himself, with AR.

General constitutional treatment was added. Patient was told to move his arm as much as he liked, taking care only to avoid movements of abduction, and was sent home without any bandage or fixation being applied.

Progress.—November 16.—Patient slept very well ; there was only very slight pain in the shoulder, which was not increased during movement.

November 18. — Patient could lift his arm to almost the perpendicular (*i.e.*, stretch position). No pain.

November 21.—Some extra strengthening exercises were added to the treatment. Patient went back to work and did nine and a half hours of metal polishing.

November 28.—Patient had been at work all the week, and said that his arm felt quite well.

December 14.—Patient continued treatment until this day. He left with his shoulder-joint quite normal. In addition to this, his digestion was much improved by the stomach exercise which he had received every day.

Patient's shoulder remained quite well until March 31, 1900, when on lifting up a weight with his right arm, he redislocated it in the same manner. He immediately came to Dr. Möller and myself, who reduced the dislocation and treated it in the same way as on the first occasion. After treatment hardly any pain. No bandage was used.

April 1.—Slight pain anteriorly in the front of the shoulder. Active and duplicate movements executed.

April 3.—Treatment for the last time. Patient normal. He returned to work again.

March, 1902.—There had been no further dislocation.

Dislocation of left Humerus.

E. S., female, aged $3\frac{1}{2}$, came under the manual treatment on July 7, 1902.

History of present condition.—The day previously patient had been playing about; while running after another child she fell down on her left arm and hurt herself very much. She screamed with pain, which she located in the left shoulder. She kept her left arm still, and any attempt to move it only caused increase in the pain. Her mother was unable to undress her in consequence and she went to bed with her clothes on. She slept very badly and the following day complained of still more pain.

Examination.—I first saw patient at 4 p.m. on July 7. The left arm hung limp; movements of the shoulder were very painful and limited to a slight amount of abduction. The shoulder was flattened and there was a depression below the acromion. The head of the humerus could be felt anteriorly below the coracoid process, and the humerus hung so that the elbow was more posteriorly than normal, and somewhat away from the trunk.

Treatment.—Reduction was effected fairly easily with very little pain by means of abduction to a right angle combined with traction away from the trunk, and then adduction with PR while the head was pressed in. Immediately afterwards the following movements for the shoulder were executed:—

(1) Sitting left arm circling, PP.

(2) Sitting left shoulder vibration and muscle kneading, PP.

(3) Sitting left arm traction sideways, PP, drawing arm towards trunk, AR.

(4) Sitting left arm abduction to right angle, PP, adduction, PR.

No bandage or fixation was used. Patient left, feeling no pain whatever, and could be seen to swing her left arm backwards and forwards as usual when walking.

Progress.—July 8.—No pain. No swelling. Movements of arm quite free. Abduction through 135°, PA, and the reverse movement, PR, was performed.

July 9.—Patient able to perform abduction through 180°.

July 11.—Movements quite normal. No pain or swelling. Shoulder normal. Treatment finished

October, 1902.—Shoulder had continued quite normal.

CHAPTER X.

DISEASES OF THE GENITO-URINARY ORGANS AND LABOUR.

Sudden Incontinence of the Bladder.

G. J., female, aged 12, came under the manual treatment on December 2, 1900.

History of present illness.—Patient had had cystitis two years previously. During December 1, 1900, sudden incontinence of the urine set in without any apparent cause, and the urine ran incessantly the whole day until patient went to bed, when the incontinence ceased. On trying to sit up, or while performing any movement requiring exertion, the urine flowed again. Patient did not sleep well, and on December 2 the incontinence again came on as before. I was sent for at 11 a.m.

Examination.—Nothing objective could be made out, excepting that patient's urine was discharged involuntarily on trying to sit up in bed, and on exertion. The urine itself was normal.

Treatment and progress.—I administered suprapubic vibrations, frictions on the umbilicus and sacral nerves, and stomach exercise. At their close patient could sit up and move without the urine flowing. She got up, and the incontinence did not return.

March, 1902.—No return of the incontinence had taken place.

Menorrhagia.

A. L., aged 27, domestic servant, came under the manual treatment on May 9, 1902.

History of present condition.—Patient enjoyed good health until 1891, when at the age of 16, menstruation of the thirty-day type commenced, and ever since the third time of its onset it had lasted for nine days, during which the discharge was very profuse. This caused her to become weak and anæmic, and she suffered continually from headache, which was very bad indeed

during her periods. In spite of various internal remedies (iron, quinine, &c.), the condition had persisted unchanged.

Examination.—Patient looked very anæmic and pale, although she had not the typical chlorotic facies. On examination there was nothing objective beyond tenderness over both ovaries, especially on the left side. Internal examination not made. There was no constipation ; heart and lungs were healthy.

The last period of menstruation was from April 30 to May 8.

Treatment.

(1) Half lying double foot rolling, PP, flexion and extension, AR.

(2) Stretch stride standing bending forwards, PA.

(3) Forwards lying back exercise, PP.

(4) Reach grasp stoop fall standing double elbow flexion and extension, PA, shoulder hacking, PP.

(5) Sit lying knee extension and flexion, PP, extension, AR, flexion, PR.

(6) Ride sitting alternate rotation, AR, ringing, PP.

(7) Reach grasp step standing knee flexion and extension, PA, sacral beating, PP.

(8) Half lying leg rolling, PP, flexion, PA, extension, AR.

(9) Crook half lying double knee abduction, AR, adduction, PR.

(10) Half lying stomach exercise, ovary vibrations, PP, sacral nerve frictions, PP.

No exercises were omitted during the menstrual periods, as depletion of the pelvic organs was aimed at.

Progress.—May 30.—Very little headache since the treatment commenced; general condition stronger. Menstruation began this day.

June 4. Menstruation ceased after having lasted only six days; less headache meanwhile than usual.

June 30.—No headache at all since June 4. Patient's anæmic look was almost gone, and she said that she felt quite well and strong. Menstruation commenced to-day.

July 5.— Menstruation ceased, again having lasted only six days. Very slight headache during the third and fourth days, otherwise none.

July 9.—Treatment finished. Patient normal, excepting for a

slight amount of tenderness over the left ovary; that on the right side had quite disappeared.

September 16, 1902.—I heard from patient's mother that menstruation had lasted for only six days on the last two occasions.

Threatening Mammary Abscess.

Mrs. C., aged 28, came under the manual treatment on October 27, 1901.

History of present condition.—Patient was delivered of her first child on October 13, 1901; the presentation was an R. O. P. and the labour was normal. On October 17 patient was up and about, and I ceased attending her on October 24. Patient's lactation was normal until October 27, when she slept badly and had much pain and sense of weight in the right mamma. I was sent for in the morning.

Examination.—The right mamma was indurated, swollen, somewhat red, painful, and extremely tender in three spots, one near the nipple, one in the outer upper quadrant, and one in the outer lower quadrant. She had had several rigors, and said she felt ill. Temperature 102·6°, pulse 129.

Treatment.—Vibrations over the mamma, specially the tender spots; expression of the milk by means of suction vibrations; frictions on the descending cervical, anterior thoracic, and fourth to sixth intercostal nerves; constitutional exercises. At the close she felt better, and had much less pain and tenderness.

Progress.—October 28.—Morning. Patient had slept fairly well. Some redness and tenderness. Temperature 101·6°, pulse 104. Treatment. Afternoon. Temperature 101°, pulse 98. Treatment.

October 29.—Morning. Only slight tenderness left. Temperature 97°, pulse 78. Treatment only once during the day.

October 30. — No tenderness. Mammary gland normal. Treatment for the last time

(The temperatures were all taken in the mouth).

September, 1902.—No return of the symptoms.

Labour.

Mrs. Q., aged 36, came under the manual treatment on May 11, 1900.

Previous history.—Patient had previously two children, both girls; the first born on August 8, 1894, the second on April 25, 1897. Both labours were normal, the first lasting about fourteen hours; the second about seven.

Present labour.—Commenced at 5 p.m. on May 11; at 9.45 p.m. I was sent for. Patient was standing up and walking about, with pains coming about every five minutes; she was already in the second stage. Vaginal examination.—Cervix fully dilated, head presentation in the L. O. A. position. The vertex about one inch from the external opening. The membranes ruptured during the examination.

During the pains that now came I executed frictions over the sacral nerves and also in the lumbar region, where the patient complained of pain. These frictions were performed with one hand while the other simultaneously executed vibrations on the coronal suture. Patient liked these manipulations very much, and told me that they not only relieved the pain, but also gave her energy and helped in the expulsion of the fœtus.

At 10.15 p.m. the labia separated slightly during each pain, and the fœtal scalp began to appear. At 10.20 p.m. the head was born; and one minute later the rest of the fœtus. While the child was being attended to, I executed frictions over the uterus. At intervals I also executed sacral nerve and uterine frictions, and stomach exercise. Patient liked the manipulations very much and said they made her feel very comfortable.

The placenta was born entire at 11.45 p.m.; I then executed a few more uterine and sacral nerve frictions; the uterus was well contracted, and I left patient at 12.10 a.m. on May 12.

May 12.—No after pains at all. Treatment twice by sacral nerve and uterine frictions and stomach exercise.

May 13.—No after pains. Everything going on favourably. Treatment twice on same lines as before.

May 14.—Treatment once as before.

May 15. — Patient got up during the morning and was up most of day. Treatment once.

May 16.—Patient up and moving about as usual. Treatment for last time.

September, 1902.—Patient quite well.

APPENDIX.

The following is a short account of all the specific infectious diseases and other severe acute cases, attended by fever and constitutional disturbance, in which the diagnosis was absolutely certain, that I have treated personally from 1898 to the present time (September, 1903).

Unless specially mentioned there were no complications.

No. of Case	Initials or Name of Patient	Sex	Age	Name of Disease	Treatment lasted	Result	Remarks	Case described on page
1	C. G.	M.	24	Typhoid fever	March 30—May 3, 1902 ...	Perfect recovery	... ...	253, &c.
2	A. F.	M.	36	,, ,, ...	May 9—May 13, 1902 ...	Died	... ...	482
3	J. L.	M.	12	Typhoid fever and acute middle ear disease ..	June 12—July 26, 1902 ...	Perfect recovery		
4	Mrs. S.	F.	38	Typhoid fever	June 12 –July 25, 1902 ...	,, ,,		
5	A. C.	F.	15	Scarlet fever	Feb. 21—March 6, 1902 ..	,, ,,	... ...	266, &c.
6	H. C.	F.	39	,, ,, ...	Feb. 26—March 6, 1902 ...	,, ,,	... ...	269, &c.
7	E. L.	F.	$15\frac{3}{4}$	,, ,, ...	Feb. 28—March 9, 1902 ...	,, ,,	... ...	270, &c.
8	G. C.	F.	9	,, ,, ...	March 1—March 7, 1902 ...	,, ,,	... ...	273
9	E. K.	F.	28	,, ,, ...	March 5—March 12, 1902 ...	,, ,,	Complicated by chill	274, &c.
10	M. K.	F.	6 months	,, ,, ...	March 5—April 10, 1902 ...	,, ,,	Complicated by middle ear disease ...	276
11	R. K.	F.	$2\frac{1}{2}$	,, ,, ...	March 6—April 3, 1902 ...	,, ,,	Complicated by severe chill and mumps(?)	276, &c.
12	T. J.	M.	16	,, ,, ...	March 7—March 14, 1902 ...	,, ,,	.. ..	278, &c.
13	E. W.	M	23	,, ,, ...	March 17—March 27, 1902 ...	Perfect recovery by April 1	... ...	280, &c.
14	S. N.	F.	7	,, ,, ...	March 19—March 31, 1902 ...	Perfect recovery	Complicated by mumps	282, &c.
15	A. N.	M.	$6\frac{1}{2}$ months	,, ,, ...	March 29—April 14, 1902 ...	,, ,,	,, ,, ...	284, &c.
16	I. J.	F.	$14\frac{1}{2}$	,, ,, ...	April 5—April 19, 1902 ...	,, ,,	Followed by mumps	286, &c.
17	Eva Cyriax	F.	18	Measles	About 10 days (March, 1898)	Perfect recovery		
18	Richard Cyriax	M.	12	,, ...	,, 14 ,, ,, ,,	,, ,,		
19	Tony Cyriax	F.	15	,, ...	,, 17 ,, ,, ,,	,, ,,		
20	H. L.	M.	$3\frac{1}{4}$	,, ...	Aug. 6—Aug. 22, 1902 ...	,, ,,	... ...	263, &c.
21	E. P.	F.	17 months	Measles following on whooping cough	Aug. 30—Sept. 11, 1902 ...	,, ,,	... ...	260, &c.

22	E. M.	F.	35	Measles	About 3 weeks (January, 1900)	Perfect recovery		
23	A. v. V.	F.	4	,, ...	Sept. 27—Oct. 17, 1900 ...	,, ,,		
24	Richard Cyriax	M.	15	German measles ...	About 8 days (April 1901) ...	,, ,,		
25	S. N.	F.	7	Mumps	... ...	... ...	See case 14	
26	A. N.	M.	6½ months	,, ...	... ...	... ...	,, 15	
27	I. J.	F.	14½	,, ...	... ...	... ...	,, 16	
28	S. N.	M.	10	,, ...	March 5—March 10, 1902 ...	Perfect recovery		
29	O. F.	M.	12	,, ...	March 22—March 26, 1902...	Perfect recovery by April 1, 1902		
30	G. J.	M.	10	,, ...	April 11—April 20, 1902 ...	Perfect recovery	... ...	289, &c.
31	H. A.	M.	1	Whooping cough ...	Aug. 12—Aug. 22, 1902 ...	,, ,,		
32	A. W.	F.	4	,, ,, ...	Oct. 16—Dec. 6, 1902 ...	,, ,,	... ...	259, &c.
33	E. P.	F.	17 months	,, ,, ...	Aug. 30, onwards	,, ,,	See case 21	
34	A. S.	M.	24	Influenza...	Aug. 16—Aug. 30, 1901 ...	,, ,,		
35	Mrs. T.	F.	29	,, ...	Aug. 27—Sept. 10, 1900 ...	,, ,,	Patient was treated until Sept. 30, on which date a normal confinement took place	
36	E. S.	M.	2½	Epidemic cerebro-spinal meningitis	Aug. 18—Aug. 28, 1899 ...	,, ,,	... ...	298
37	T. O.	M.	8	Epidemic cerebro-spinal meningitis (?)	Aug. 14—Aug. 24, 1899 ...	,, ,,		
38	Edgar Cyriax	M.	25	Diphtheria	Dec. 3, 1899—Jan. 12, 1900...	Perfect recovery by about March 1	... ...	291, &c.
39	J. S.	M.	10	,, ...	Nov. 27—Dec. 2, 1899 ...	Died	... ...	482
40	K. O.	F.	5	Erysipelas	Aug. 29—Sept. 20, 1900 ...	Perfect recovery	... ...	293
41	D. P.	F.	42	,, ...	Sept. 29—Oct. 20, 1901 ...	,, ,,		
42	Edgar Cyriax	M.	28	Rheumatic fever and erythema	May 16—July 31, 1902 ...	,, ,,	... ...	300, &c.
43	Hilda Cyriax	F.	23	Rheumatic fever ...	June—July, 1899 (7 weeks)...	,, ,,	Heart remained unaffected	
44	A. K.	M.	18	,, ,, ...	July 17—Aug. 28, 1900 ...	,, ,,	,, ,,	
45	A. P.	M.	35	,, ,, ...	July 1—July 22, 1899 ...	Partial recovery	Recovery was not complete by July 22, on which date patient stopped the treatment. Further progress of disease unknown	
46	E. B.	F.	10	Rheumatic pericarditis, &c.	Aug. 15, 1902	... ...	... ...	370, &c.
47	Mrs. G.	F.	37	Severe rheumatic cephalalgia	Feb. 6—Feb. 15, 1902 ...	Perfect recovery		
48	E. S.	M.	4	Erythema nodosum	Feb. 26—March 22, 1901 ...	,, ,,	... ...	309, &c.
49	G. A.	M.	11	Acute parotitis bilateralis	June 17—June 23, 1900 ...	,, ,,		
50	L. L.	M.	10	Acute tonsillitis... ...	Nov. 19—Nov. 25, 1899 ...	,, ,,	No abscess formation	

No. of Case	Initials or Name of Patient	Sex	Age	Name of Disease	Treatment lasted	Result	Remarks	Case described on page
51	Miss C.	F.	50	Acute tonsillitis... ...	Sept. 25—Oct. 6, 1898 ...	Perfect recovery	No abscess formation	
52	E. T.	M.	28	,, ,, ...	5 days in Nov., 1898... ...	,, ,,	,, ,, ,,	
53	E. S.	M.	13	,, ,, ...	Oct. 21—Oct. 25, 1899 ...	,, ,,	,, ,, ,,	
54	E. S.	M.	14	,, ,, ...	Nov. 27—Dec. 2, 1899 ...	,, ,,	,, ,, ,,	
55	D. S.	M.	12	,, ,, ...	Nov. 27—Dec. 2, 1899 ...	,, ,,	,, ,, ,,	
56	R. A.	F.	19	,, ,, ...	Oct. 19—Oct. 20, 1899 ...	,, ,,	,, ,, ,,	
57	R. R.	M.	10	,, ,, ...	Nov. 24—Nov. 25, 1900 ...	,, ,,	,, ,, ,,	
58	W. T.	M.	10	,, ,, ...	Nov. 24—Nov. 29, 1899 ...	,, ,,	,, ,, ,,	
59	A. K.	F.	14	,, ,, ...	March 4—Nov. 7, 1901 ...	,, ,,	,, ,, ,,	
60	Mrs. H.	F.	60	,, ,, ...	Nov. 6—Nov. 20, 1900 ...	,, ,,	,, ,, ,,	
61	G. W.	M.	30	,, ,, ...	Dec. 31, 1901—Jan. 2, 1902	,, ,,	,, ,, ,,	
62	V. L.	M.	58	,, ,, ...	April 25, 1900...	Perfect recovery by April 28	,, ,, ,,	
63	K. I.	M.	39	,, ,, ...	Oct. 17 onwards	Perfect recovery	... ...	335, &c.
64	Miss L.	F.	13	Acute gastro-intestinal catarrh	Dec. 19—Dec. 21, 1900 ...	,, ,,	... ...	345, &c.
65	Mrs. S.	F.	28	Acute intestinal catarrh	Aug. 20—Aug. 23, 1900 ...	,, ,,	... ...	346, &c.
66	Mr. K.	M.	43	Acute catarrhal appendicitis	Aug. 18—Sept. 5, 1898 ...	,, ,,	... ...	336, &c.
67	J. A. S.	M.	35	Acute catarrhal appendicitis	July 23—Aug. 9, 1902 ...	,, ,,	... .	339, &c.
68	Mrs. S.	F.	39	Acute peritonitis ...	Feb. 25—March 22, 1902 ...	,, ,,	... ...	341, &c.
69	Mrs. L.	F.	38	,, ,, ...	April 17, 1900	Died	... ...	482
70	J. P.	M.	10	,, ,, ...	Aug. 25, 1900	Died	... ...	483
71	M. W.	F.	7	Acute pelvic peritonitis	Aug. 27—Oct. 7, 1899 ...	Perfect recovery		
72	S. O.	F.	6	Jaundice	May 31—June 1, 1900 ...	Perfect recovery by June 6		
73	Miss S.	F	25	Acute ulcerative laryngitis	April 12—April 27, 1903 ...	Perfect recovery		
74	U. B.	M.	6 months	Croup	Jan. 23—Jan. 28, 1900 ...	,, ,,		
75	K. B.	F.	2	Croup	Dec. 11—Dec. 14, 1900 ...	Perfect recovery by Dec. 17		
76	Mrs. L.	F.	27	Acute bronchitis ..	Feb. 28—March 7, 1900 ...	Perfect recovery	... ...	316, &c.
77	Mrs. O.	F.	81	,, ,, ...	May 3—May 15, 1900 ...	,, ,,		
78	H. R.	F.	16	Mild acute bronchitis ...	4 days (May, 1899)	,, ,,		

79	P. R.	M.	4	Acute croupous pneumonia	July 11—July 29, 1899 ...	Perfect recovery			
80	H. S.	M.	35	Acute croupous pneumonia	Aug. 19—Sept. 16, 1899 ...	,, ,,			
81	K. S.	M.	33	Acute croupous pneumonia	March 28—May 9, 1900 ..	,, ,,	... ...		314, &c.
82	Mrs. L.	F.	48	Acute croupous pneumonia	Aug. 21—Sept. 12, 1899 ...	,, ,,			
83	A. A.	M.	9	Acute croupous pneumonia	March 15—March 19, 1902...	,, ,,	Crises occurred on March 18; patient up and about by the 19th; quite well by the 28th		
84	G. I.	M.	2½	Broncho-pneumonia ...	Nov. 27—Dec. 6, 1899 ...	... ...	By Dec. 6 lungs quite normal and patient up and about and eating as usual, although not yet quite strong; later on perfect recovery		
85	W. W.	M.	3	,, ,, ...	May 8—May 13, 1900 ...	Died	... ...		483
86	E. L.	F.	7 months	,, ,, ...	Aug. 30—Sept. 1, 1902 ...	Died	... ...		483
87	R. G.	F.	5	Acute dry pleurisy ...	July 10—July 24, 1899 ...	Perfect recovery			
88	E. M.	M.	30	,, ,, ,, ...	Nov. 12—Nov. 25, 1899 ...	,, ,,			
89	H. S.	M.	15	,, ,, ,, ...	Nov. 19—Dec. 2, 1901 ...	,, ,,	... .		319, &c.
90	Mrs. K.	F.	42	Acute exudative pleurisy	May 18—June 21, 1902 ...	,, ,,			
91	E. A.	F.	28	Relapse of diaphragmatic pleurisy	Jan. 2—Feb. 8, 1902 ...	,, ,,			
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I shall now proceed to give a few brief notes of the cases in the above list in which death resulted.

Case 2 (A. F.).—*Typhoid fever.*—Patient had been suffering from the above complaint since May 2, 1902. I was called in on May 9. For the past six days patient had had an evening temperature of from 103·7° to 105·1°, with morning remission of only one to two-fifths degree. Examination: Patient very weak; semi-unconscious; great distension of the abdomen; olive-green motions; cardiac action irregular. May 10, cerebral symptoms set in, delirium at intervals with muscular twitchings; cardiac action intermittent. May 11, threatening heart failure all day, great irregularity and intermittence. During the evening violent delirium for nearly four hours without intermission. May 12, meteorism more marked; heart slightly better than during the previous day. During the evening some delirium for an hour, after which collapse, coma vigil and death at 6 a.m. on May 13. From May 10 to 13 the temperature fluctuated between 102·4° to 103·7°, and pulse between 132 and 144.

Case 39 (J. S.).—*Diphtheria.*—Patient had been suffering from the above complaint for ten days before I was called in (November 27, 1899). Examination: Patient already had complete laryngeal paralysis and evidence of the diphtheritic membrane in the bronchi. Temperature 101·6°, pulse 120. November 28, dyspnœa and violent paroxysms of coughing, during one of which a cylindrical piece of membrane one and a half inches long and one-third of an inch thick was coughed up. November 29, condition about the same, ·05 per cent. albumen. November 30, membrane extending down into the smaller tubes. December 1, cyanosis marked, heart irregular. December 2, patient very weak, great cardiac dilatation. December 3, convulsion shortly after midnight, after which patient became semi-unconscious and died at about 6 a.m.

Case 69 (Mrs. L.).—*Acute peritonitis.*—Patient had been suffering from this complaint since April 11, 1900, and had been heavily dosed with the Swedish tincture thebaica. On April 16 her medical man stated that she could not possibly live more than twenty-four hours. Twenty hours after this opinion had been given I was called in (April 17). Patient *in extremis*: great distension of abdomen, cardiac action rapid and hardly perceptible, retention of urine for the last three days necessitating

the use of a catheter. Temperature 104°, pulse 125. Patient slightly better after treatment. I treated her again during the evening and some further improvement took place. I said that I would stop overnight in the house, and that I was to be called if she became worse. At 2 a.m. on April 18 patient did get worse, but her relatives, who had peculiar religious ideas, decided that it was the will of God that she should die, and that I should not interfere. I accordingly was not sent for, and patient died at 3 a.m.

Case 70 (J. P.). — *Acute peritonitis.* — Patient had been suffering from the above complaint for twelve days. His medical man had prescribed him the Swedish tincture thebaica, and on August 25, 1900, he told the parents that there was no hope; I was, however, called in. I found patient *in extremis*, cold and clammy, semi-unconscious, with great distension of the abdomen. Temperature 104·4°, pulse 172, very weak. I treated him three times during the course of the day without, however, effecting any improvement, and he died at midnight.

Case 85 (W. W.).—*Broncho-pneumonia.*—Patient, who was rickety, was seized with a severe attack of the above complaint on April 16, 1900, and remained in practically the same state until May 8, when I was called in. No advice had been sought previously. On examination all the signs of severe broncho-pneumonia were present; there was retraction of the head. Temperature 104°, pulse 160. During the following day patient was worse. Temperature 104·4°, pulse 180. On May 10 and 11 patient was slightly better, on May 12 worse and semi-unconscious. Pulse over 190. Death took place on May 13.

Case 86 (E. L.).—*Broncho-pneumonia.*—Patient was born prematurely (seventh month), had always been very weak, and had hardly grown at all since birth. She had suffered from whooping-cough during the last month, and on August 24, 1902, broncho-pneumonia set in, the temperature going up to 102·6°. She became steadily worse until August 30, when her medical man pronounced the case hopeless, and I was called in. Examination: Patient very ill; marked cyanosis; semi-unconsciousness; signs of severe broncho-pneumonia. Temperature 104°, respiration 60, pulse 165. August 31, condition still worse. September 1, still worse; patient looked as if she might die at any minute. September 2, death at 2 a.m.

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